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Quantitative economics and its constraining assumptions

The Way Out

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The employment potential of micro enterprises¹

Vinod K. Anand²

Abstract

Employment generation is the policy priority in all developing countries, especially when declining employment opportunities are combined with rapidly growing labour force, and also when the labour force has a disproportionate number of relatively unskilled workers. Both theoretical and quantitative studies strongly reveal that the major source of employment creation in these countries is the informal (unorganized) sector. The data set of the various developing countries supports this statement. For example, in the context of India it is seen that in 1999-2000 the formal (organized) sector employment was only 28.11 million i.e., about 7 per cent of the total employment of about 397 million. The remaining labour force was employed in the various segments of the informal (unorganized) sector. It was also indicated that the formal (organized) sector employment, apart from being so less, also showed declining trends. In fact the scenario has been almost the same over the different decades, and even beyond 2000. The developing countries have, therefore, to depend, to a very large extent, on the informal (unorganized) sector for the much needed employment creation. There may be slight inter-country and inter-regional variations in this context, but the overall picture remains the same, and informal (unorganized) sector contributes immensely to employment-creation in all the regions of the developing world.

The recent initiative (2005) of the Government of India to boost small and medium sized enterprises (SMEs) within the informal sector of the economy in the shape of a four-pronged strategy is indeed a welcome step. According to available data, SMEs contribute 40 per cent of the country's GDP, almost half of India's exports and generate 45 per cent of industrial employment. The SME Development Bill in this regard will be taken up for passage in Parliament in the winter session. The country's first dedicated credit rating agency for SMEs (SMERA) has already been launched. It will have an involvement of major public and private banks. This is an important aspect of the Government's broad plan to boost SMEs. The limit for Credit-linked Capital Subsidy Scheme too would be enhanced from Rs. 40 lakhs term loan to Rs. 1 crore, while the percentage would be simultaneously enhanced from 12 to 15 per cent. The SIDBI would soon be remodeled to serve the SME sector. The proposed Bill is aimed to benefit the rated SME units including the SSI and tiny sector essentially in terms of adequate and timely credit, low collaterals and lower rate of interest.

In this kind of a background, this Paper attempts to focus on the role of the micro enterprise sector in creating employment opportunities for a large number of people, especially in the developing countries. It also looks at the varied contributions of this sector to economic development, and then also points out its potential (unrealized) advantages that are behavioural in nature and relate essentially to human resources. It finally looks at the disadvantages of this sector that lie essentially in material resources.

Introduction

There is an abundance of literature to support the view that the scope for generating major increases in industrial employment in large manufacturing firms remains limited (Pack, 1978; White, 1978). The rate of employment creation in low and middle-income countries generated via growth in the output of large-scale, formal-sector enterprises has failed miserably to keep pace with high rates of urban, semi-urban, and rural labour force growth. As a result, both policy decision-makers and international aid agencies have placed greater reliance on informal, micro-enterprises which survive without the active encouragement of public authorities; indeed, frequently with their disapproval (Page, 1979; ILO, 1972). This sector is also sometimes called the unincorporated sector and is

1 Whatever is said here about micro units also equally applies to small units.

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broadly indicated by 'ease of entry, reliance on indigenous resources, family ownership of enterprises, small scale operations, labour intensive and adapted technology, skills acquired outside the formal school system, and unregulated and competitive markets' (Meier, 1984; Romatet, 1983).³

A major reason for the lack of interest by public authorities in such informal enterprises is that the cost of collecting and compiling basic information on informal activities, to design promotional programmes and to appraise the performance of such activities, is deemed to be too high relative to the immediate benefits accruing to the economy from such activities. As a result, time-series data and even qualitative appraisals are not available on micro and small, informal enterprises. Therefore, even though there is a growing body of theoretical and empirical literature on the development role of micro-enterprises, little is known about the operation of such micro-enterprises in particular countries, such as India, essentially at the state and district levels.

It is generally seen that products of small-scale informal enterprises are inferior in quality (Hymer and Resnick, 1969) and lower in cost as compared to those of the formal sector. But, in many cases the output of the former can be substituted for the output of the latter. The lower cost, even if inferior in quality, makes products of the informal producers popular among the lower income classes of the population. The units falling within this sector, unlike those of the larger industrial sector, tend to be widely dispersed in provincial towns, cities, and their peripheral areas. They are also to be found, though in much smaller number, in the rural areas. As the towns grow this sector also grows with them. This sector includes a variety of non-farm small-scale activities (both in terms of investment, and scale of operation) such as repairs, metal and woodworking, clothing and shoe manufacture, construction, petty and retail trades, and other services. Even the street hawkers, shoeshine boys, and other groups of underemployed on the streets of big towns belong to this sector. The units falling within this sector can be classified into three distinct sub-classes: production and supply (manufacturing); procurement and supply (retailers and wholesalers), and supply of services. It is for this reason that development of informal activity becomes socially desirable for an egalitarian society. Another point of strength lies in its employment potential. Some of the arguments that have been advanced in this context in a large number of studies (Page, 1979; Anderson, 1982; Anderson and Khambata, 1981; World Bank, 1978A; World Bank, 1978B; Hoselitz, 1959; Staley and Morse, 1965; Dhar and Lydall, 1961; Berna, 1960; Kilbey, 1962; Aubrey, 1951; Meier, 1984) are briefly mentioned below:

- 1) Relative to large-scale, formal sector enterprises, the micro-enterprises absorb smaller shares of total investment funds available, account for an

3 As against informal sector, the features of formal sector are its obverse, and are: difficult entry, frequent reliance on overseas resources, corporate ownership, large scale operations, capital intensive and often imported technology, formally acquired skills (often expatriate), and protected markets (through tariffs, quota, and trade licenses).

appreciably larger share of recorded industrial employment (despite debilitating restrictions frequently imposed by the authorities), and provide employment that can be deemed both efficient (in an economic sense) and profitable;

- 2) Case studies of indigenous medium and large firms have shown that a number of them have achieved their current market position through the expansion of previously small firms;
- 3) The small firms are more labour intensive and more geographically dispersed, which makes them more accessible to other indigenous entrepreneurs and consumers alike and makes them amenable to policy initiatives designed to increase the local demand for labour, improve earning opportunities for many, and achieve a better regional industrial development and income distribution. It is for these and other reasons that a policy of encouraging micro-enterprises is highly desirable, both from national as well as regional perspectives.

Beyond that the review of many empirical studies of firm size undertaken by Aiginger and Tichy (1991) clearly indicates that, as compared to large firms, small firms (including micro firms) perform best in terms of employment growth, and also in terms of value added growth and possible profits. This is so because they often become more vertically integrated and hence tend to raise their employment to sales or value added to sales ratio (Levy, 1993). This explanation has received further support from Stigler (1968) in his life cycle interpretation of Adam Smith's famous contention that the division of labour is limited by the extent of the market. Stigler maintains that when firms are in their initial stages (i.e., when their size is micro or small, when they are still growing, and when the supply sources of distribution outlets are unavailable) it is normal for them to vertically integrate⁴. This theory is well supported by Williamson (1975) and Levy (1984). As compared to large firms, small firms (including micro firms), however, fail to do their best in terms of sales growth and efficiency measures.

It is interesting to analyze the employment implications of one of the basic characteristics of micro and small enterprises that we have already mentioned in the preceding pages, and which relates to their high cost of production and also with their inferior quality of products (in terms of durability and satisfaction, but not in terms of being functional). One of the straightforward implications that emerge is that these enterprises create employment, but at a high cost, while the ideal position would have been creation of employment at the minimum possible cost. Taking this implication seriously, and trying to inhibit the growth of these enterprises on this particular ground of 'high cost', employment would lead to even more serious repercussions, including the emergence of illegitimate and illegal avenues of employment in the name of earning a livelihood, which, on

4 As the firms mature and become medium and large they tend to disintegrate because nonintegrated establishments become available.

the one hand, will involve tremendously high moral and ethical cost, and, on the other, will not be in any way linked with production, but only with the generation of transfer incomes adding to a variety of rent-seeking and directly unproductive profit seeking activities (Anand, 1996). This argument has another dimension that emerges when cost is understood not in purely economic terms, but in terms of the use of labour i.e., in terms of efficiency ratio, measured normally by labour-capital ratio, and also termed as capital intensity. This matters a lot especially in a capital scarce and excess labour economies. It also indicates the capacity of capital to absorb labour. The higher is this capacity, the higher becomes the efficiency ratio, and lower becomes the cost, net of efficiency. The reason is that higher labour absorption of scarce capital is what is needed to create more employment. There is enough evidence to show that micro and small firms are characterized by relatively higher efficiency ratio in the given sense, and hence lower net cost in terms of this ratio, and this goes in favour of their employment-generation capacity. As can be seen, the argument developed above is linked with the demand for labour per unit of capital. Employment potential of micro and small enterprises is subject to this underlying assumption of labour-absorption capacity of capital. Any support policy violating this assumption will undoubtedly downplay the role of these enterprises in the creation of employment.

There is also another interesting insight. It has been seen that in recent decades there has been some kind of sudden government interest (both in developed and newly industrialized economies) to promote and support micro and small enterprises. This has basically been derived from the experience of the developing countries in respect of the macro-level industrial development policies (based on coherent strategies involving both large and small enterprises), which have failed to a large extent to achieve the twin objective of production growth and equity distribution (Arghiros, 1997; Muscat, 1996; Parnwell, 1996). It has been argued on the basis of the following facts (Birch, 1982; Haltiwanger and Schub, 1996; Penrose, 1980) that micro and small enterprises are much more capable of contributing to productive employment than the large firms:

- We have said earlier that micro and small firms are more labour intensive, and, hence, are not too costly or even unprofitable. Because of these facts, investment costs incurred in creating any job in these firms are comparatively low;
- The amount of initial capital, the extent of management, and other scarce inputs required by these firms are low, and, therefore, the various segments of the labour force that are underemployed or unemployed invariably emerge on their own, of course with little assistance from others;
- Micro and small firms create more jobs for the unskilled than for the skilled, and hence are worth promoting in many developing countries where the major segment of the labour force is unskilled;

- Apart from creating direct employment, these firms also create indirect employment, because they usually produce and subcontract locally.

Apart from economic and social arguments emphasizing the employment potential of micro and small enterprises in developing countries, there also exists a political dimension, which is very well elaborated by Regnier (2000) who says that “ *the history of the industrial revolution shows that a dynamic small entrepreneurial culture and the existence of dense and diversified class of small and medium-sized entrepreneurs are intimately related to the sustainable performance of pluralistic regimes (I would say democratic regimes, but the concept might sound too Western-influenced). Small entrepreneurs tend to belong to and cooperate with the middle class, and they can pressure local and central authorities to adopt and implement good governance practices⁵. For instance, they can lobby and negotiate for the improvement of both hard and soft infrastructure in favour of local industry and community. In other words, the concept of good governance can be associated with regimes able to promote a sound environment for nurturing entrepreneurial and self-employment capacities among various segments of the population. Such argument can be illustrated by the modern industrial policy of various Asian and European countries well known for their very dynamic small entrepreneurial culture such as Italy in Western Europe or Taiwan in East Asia (also see, Goodman and Bamford, 1989).*”

It is for these and other reasons that a policy of encouraging the establishment of micro and small units, and also supporting those that are already there, becomes highly desirable in developing countries. Talking in terms of the experience of the African continent, it has been shown by many survey results in a number of countries (Mead, 1994) that

- about 17 to 27 percent of the working population (between the age of 15 and 64) are employed in micro and small enterprises;
- the number of people engaged in the micro and small enterprises per 1000 persons in the population (termed as employment density) ranges from 70 to 90 in Botswana, Kenya, Lesotho, Malawi, and South Africa to well over 100 in the Dominican Republic, Swaziland, and Zimbabwe;
- total number of people engaged in micro and small enterprises is almost twice the number of people in registered large scale enterprises and in the public sector.

As we have said earlier micro and small enterprise units are essentially labour intensive (or labour using), but in cases where these units are both labour intensive and capital intensive, their promotion will still generate employment though partly at the cost of output growth. It is also true that the products of these units are inferior in quality as compared to those of the large industrial sector, and, therefore, are demanded less as income rises. As such, the promotional policies for these

5 In this context see Girling, 1966 and also Hewison, 1997

units will have much less impact (Page, 1979). The first situation of micro and small units, being both labour and capital intensive, is not very common in developing countries, but probably the second situation of their producing inferior quality products is quite common. To the extent the second situation prevails in these countries, the arguments advanced in favour of the employment potential of micro and small units lose force. But, no matter what it is, the labour intensity argument stands, and is quite sufficient in itself to justify all kinds of promotional and support programmes for this sector. We have, thus, all the justification to give a boost to this sector.

There is, therefore, a clear case to give proper support to the micro and small enterprise sector through various means, such as provision of easier access to credit, advising on product improvement, imparting appropriate training to reduce the inherent risk aversion of the owners and to improve their skills, provision of better tools and technology, improving infrastructure and marketing (especially generating additional demand), devising and implementing suitable support strategy, introducing reward system, and encouraging strategic partnering. According to Anderson and Khambata (1982), the programmes have the following elements: finance, extension and advisory services, vocational and management training, provision of infrastructure, technical services, and specialized marketing, and setting up of industrial estates⁶.

Contributions of Micro Units to Development

While talking of the employment potential of micro and small enterprises in the above pages we had also emphasized the fact that these enterprises also do their best in terms of value added growth. In other words, they appreciably add to the overtime growth of Gross National Product (GNP). This, therefore, is one of the most important *quantitative* contributions of these enterprises to the national economy. Coupled with this, these enterprises also significantly contribute *qualitatively* in terms of what we term as development. In essence, therefore, micro and small enterprises foster to a great extent the private sector's contribution to both growth and equity objectives of developing countries (Liedholm and Mead, 1988, Servon and Bates, 1998). These enterprises have the potential to contribute to the development process in a variety of direct and indirect ways, some of which are closely interlinked and are also overlapping, and some of which are also complicated and complex. Liedholm and Mead (1999) have very well summed up such potential of these enterprises. In this context, it has to be remembered that such enterprises have extreme heterogeneity, because of which different categories and types of enterprises have different contributions to make to the process of development. Some of them are particularly effective in combating poverty, while others contribute immensely to economic growth, and other social objectives. On the whole, therefore, these enterprises contribute to

- household income and welfare especially of the lower strata of the society

⁶ For promotional programmes also see Staley and Morse (1965)

through employment, household well-being, asset accumulation, skill development, and rewarding and durable economic opportunities;

- self-confidence and empowerment to individuals through social recognition;
- social change, political stability, and democracy by building up confidence of the individuals in all kinds of community-based institutions, the creation of innovative institutional structures based on people's needs and requirements, and by cultivating a feeling of responsibility;
- distributional and developmental objectives by providing new opportunities to the various sections of the society like the poor, the proletariat, the tribal, the women, and the people staying in remote and isolated areas;
- The demographic scenario through reduction in birth rates, and also in rural-urban migration.

What has been said above is greatly supported both by the experience of developing countries, and by the findings of a number of studies in this area. For example, a set of studies (Liedholm and Mead, 1988) conducted jointly by Michigan State University and host country experts in twelve developing countries namely, Sierra Leone, Jamaica, Thailand, Honduras, Egypt, Bangladesh, Haiti, Burkina Faso, Zambia, Botswana, Indonesia, and Kenya⁷, makes it very clear

Table 1: Showing Contribution of Micro and Small Enterprises to Income and Welfare

	New Starts Enterprises	Non-growing	Small-growers Enterprises	Expanding Enterprises	Total, all
<i>1. Contribution to employment</i>					
Share of all existing enterprises	28.1%	42.8%	12.0%	0.6%	100%
Share of emp. among existing enterprises	26.0%	27.7%	18.4%	5.1%	100%
Source of new emp over the long haul	80%	0%	10%	5%	100%
Av. number of workers per enterprise	1.8	1.2	2.9	16.3	19
<i>2 Part-time or full-time activities</i>					
Av. Number of months worked per year	10.6	10.9	11.2	10.7	10.9
Av. Number of days worked per month	23.3	24.2	25.4	24.8	24.3
<i>3. Contribution to household income (% of all respondents in category)</i>					
100% of household income	30.7	35.6	34.0	21.7	33.7
50-99% of household income	33.3	35.5	41.9	59.5	35.3
Less than 50% of household income	36.0	28.9	24.2	18.7	31.0
<i>4 Contribution to distributional objectives</i>					
Percentage of female owners	56.9	60.0	38.5	8.4	54.2
Percentage of female workers	47.0	55.1	35.9	8.9	42.2
Percent of employment in rural areas	71.6	74.1	70.4	79.5	72.7

Source: Liedholm and Mead, 1999, Chapter 7, Page 86

7 See "Small Scale Industries in Developing Countries: Empirical Evidence and Policy Implications", a Michigan State University Development Paper, supported by the Office of Rural and Institutional Development, Bureau for Science and Technology, U.S. Agency for International Development.

Notes:

1. All data are from the six core countries (Botswana, Kenya, Malawi, Swaziland, Zimbabwe, and the Dominican Republic).
2. New starts: These are enterprises that have just entered the business
3. Non-growing enterprises: These are enterprises that have overcome the hassles of start-up, but have not added to their employment since inception.
4. Small growers: These are enterprises that have survived for some time and have added to their work force since their inception, but their growth has not been up to the mark.
5. Expanding enterprises: These are enterprises that have expanded to reach the middle ranges of the small enterprise spectrum.

that micro and small enterprises are both diverse and geographically dispersed in these countries, and that they are highly efficient in the use of resources. As we have said in the preceding pages, they also contribute immensely to income and productive employment, and, thus, to overall growth and development. Based on the data, as collected in the above-named research, Table 1 on the next page shows the contribution of micro and small enterprises to income and welfare.

Marsden (1990)⁸ provides sufficient evidence to support the contention that modern African entrepreneurs help alleviate poverty and advance social progress. All the entrepreneurs interviewed in his surveys have created productive jobs for initially unskilled workers, and have also helped in upgrading their skills. His illustrations refer to Kenya, Cote d'Ivoire, Ghana, Malawi, and Botswana.

In the context of development, gender issues also occupy an important place. Many interdisciplinary studies combine economic, sociological, and anthropological perspectives to investigate the reasons behind the growing concentration of women in the informal sector, and to answer a number of questions like, how class and gender are articulated in a concrete working and living situation, and how women reconcile with their role in the overall labour market and the tasks performed at home (Beneria and Roldan, 1987). Thus, the role of women, essentially as wage earners in the informal sector activities, is becoming highly crucial in almost all the developing countries. Talking of South Asia in particular, it has been seen that in recent decades the scenario of division of labour in this region has changed a lot in terms of the contributions of women in society, economy, and politics (Bjorkman, 1986). The gender roles in rural areas have changed, and value of women's work has added tremendously to productive activities. Their participation in the labour force thus contributes immensely to gross national product, and, hence, to economic growth, and through that to distribution patterns. The basic point is that women by and large perform the dual function of a housewife (when their services do not account for gross national product) and that of wage-earner (when their services account for gross national product). They combine and reconcile these two functions with a perfect trade-off in a highly optimum way, thus adding to the overall well being of the society. It is also seen that Donor organizations also support projects aimed

8 Marsden(1990), Pages13, 14.

at expanding income-earning opportunities for poor women in the Third World countries (Buvinic, 1989). They generally favour income-enhancing projects in the informal economy. These efforts have, thus, helped to mainstream women's issues in employment and micro and small enterprise development. Some of these issues that need the attention of the policy makers are: expanding the demand for women's labour; opportunity costs of women's time; integrating the concerns of the poor women into anti-poverty programmes.

The informal sector of any economy, especially its retail component, is of utmost sociological and economic importance. This component is a measure of the extent to which the formal retail sector cannot adequately fulfill the basic role of providing convenient utilities. It is also important in the context of wealth creation (Broom and Joyce-Clarke, 1990).

It has also been seen that the participation of peasants in wage and informal sector employment alters the dynamics of peasant farming and adds to over all economic development. A positive interaction between farming and off-farm work, essentially in micro and small units, adds to agricultural productivity (Bernal, 1991).

The role of informal activity is also significant in household economic behaviour, and adds to the level of living of the members of the household. There is an interesting study of Cecora (1991) in this context, which is based on 100 selected households in Germany with relatively homogeneous socioeconomic and demographic characteristics, and which emphasizes the role of informal activity in the context of family well being.

Informal activity also adds to urban economic growth at various levels of urban and national development, and plays a crucial role, of course in the long run, in economic growth as far as it is linked with urban development, especially housing and employment (Drakakis, 1990).

The fact that the informal modern sector is often a dynamic actor in the process of economic development, frequently outpacing the growth of the formal modern sector, has been very well supported by Gang and Gangopadhyay (1990) who have developed a general equilibrium model to investigate the conditions under which informal sector increases its capital stock more rapidly than the formal sector. This model also looks at the employment-unemployment effects of the industrial dualism of the over-regulated formal sector and the free-entry informal sector.

Advantages and Disadvantages of Micro Units

There is no denying of the fact that informal sector is highly diverse and heterogeneous within its own framework (Anand and Nur, 1985, Anand, 1991). In fact, diversity is directly linked with the degree of informality. More is the informality, higher will be the degree of diversity, and vice versa. For example, micro and small segments of the informal sector are more diverse than the medium and large segments. Because of this diversity it becomes rather difficult to make

general statements both about the sector and its various segments. According to Nooteboom (1993) this leads to a dilemma in the context of public policy formulation. On the one hand, the public policy has to be differentiated (in terms of different packages for different segments) in order to meet diversity, and on the other, such differentiation raises the level of complexity of institutions and conditions that is already a problem for the various segments of the informal sector, like micro and small, in view of the limited awareness capacity of many such firms. In order to overcome this dilemma, it is always better to look for general statements about such firms, which are highly desirable for an effective public policy despite their diversity and heterogeneity.

In the context of micro and small firms, some of these general statements refer to their potential (unrealized) advantages and disadvantages as compared to medium and large firms. Their advantages are behavioural in nature and relate essentially to human resources, and their disadvantages lie in material resources (Rothwell, 1985). Nooteboom (1993) has summed up the potential behavioural advantages as:

- Entrepreneurial drive and risk taking;
- Motivation and perseverance;
- Motivated labour due to lack of bureaucracy and specialization;
- Flexibility; and
- Proximity of management to the shop floor.

But it must be remembered that these behavioural advantages are not automatically available. They have to be realized, and this greatly depends on the motivation and orientation of the entrepreneur (perhaps through training programmes). No policy package and training programmes can ever assure the extent to which these potential advantages can be realized, especially in the context of developing countries. Entrepreneurship in the context of micro and small firms has many dimensions. For example, it may refer to

- the primary goal of the firms in terms of profit, growth, stability, job satisfaction etc;
- orientation of all kinds such as, technical, commercial, and social;
- the framework of internal and external communication; and
- work conditions;

Nooteboom (1993) says: "*Some small firms owners are motivated towards true Schumpeterian entrepreneurship, others towards maintaining established, traditional ways of doing things (craftmanship), maintaining independence, staying small, having a quiet life. They can afford to entertain unorthodox objectives (unorthodox in the view of economic science) to the extent that they own the firm, which they often do.*"

Apart from potential advantages, small firms also have disadvantages that lie in material resources with respect to costs. In costs, there are effects of scale (in terms of producing small volumes), scope (in terms of few products), experience (of being in business and benefiting from the economics of experience), and learning (in terms of acquisition of knowledge). Effects of scale, scope, experience, and learning play a role in the decision where to produce an input that one requires, or to buy it from an outside producer. This is called 'make or buy' decision. In real practice, the diversity of these effects tends to be underestimated. Apart from these effects there are also effects of firm size on transaction costs⁹ in the stages of contact, contract, and control. These are due to 'threshold costs' in setting up contacts, contracts, and control, and also due to differences with respect to the factors that cause transaction costs.

In the context of developing countries one of the basic advantages of micro and small firms lies in their being more labour intensive, more geographically dispersed, and more accessible to indigenous entrepreneurs. As such, their promotion not only meets the policy goal of employment creation but also of improved regional and vertical distribution of income. But this crucial advantage of micro and small enterprises loses force when they become both labour and capital using perhaps to make up for their technical inefficiency as reflected by their low levels of labour productivity. In such a case, their promotion will surely involve employment creation but at high cost of a sacrifice in the growth of output. Beyond that, the composition of micro and small enterprise output may limit the scope for promotion of these firms (Page, 1979).

There is another disadvantage that stems from the fact that the output of these firms is essentially confined to inferior consumer goods (Hymer and Resnick, 1969), and as such, the demand for their products will decline as income increases, and this will, therefore, have an adverse impact on the support programmes aimed to encourage these firms.

The relations linking and dividing micro and small firms and state institutions, and the various components of each group, do sometimes offer problems, some of which are given below (Clark, 1988; Feige, 1990; Danesh, 1991; Thomas, 1992):

- Peri-legal (legitimate but illegal) activities like, illegal street hawking;
- Underground/shadow economy;
- Moonlighting and clandestine employment;
- Criminal activities, like smuggling, and patent rights violation;
- Encroachments through semi-permanent structures;
- Market relocation issues;
- Resistance to relocation by shopkeepers;
- Economic crisis and the threat to marketers;

- Violation of patents;
- Pilferage of public utilities;
- Ghetto and squatter settlements;
- Employment of child labour;
- Violation of basic labour laws, if any;
- Adding to environmental pollution, especially in congested urban areas;
- Evasion of taxes.

There have also been arguments (Peattie, 1987; Cole and Fayissa, 1991) that the informal sector is an extremely fuzzy concept and as such the conventional dichotomy between informal and formal sectors does not serve as a useful description of welfare and income. An alternative is suggested in terms of a taxonomic system, which, in fact, supplements the informal/formal system. Quite a number of studies now focus on labour force units rather than firms) and this perspective provides an analytical category in the shape of working poor, both in rural and urban areas. The study of this segment of the labour force has significant advantages for the study of issues like income-distribution, poverty, and rural-urban migration.

It has also been argued that

- the would-be entrepreneurs of micro and small enterprises are invariably peasants prior to entering the urban setting, and hence they are normally guided not by profit maximization, but by effective utilization of household labour (Thomas, 1992), and that they are also risk averse;
- the small size limits the scope for specialization and realizing economies of scale (Truu and Black, 1980);
- the activities of micro and small enterprises, no matter what they are, focus more on non-tradable than tradable, and, hence, they only take advantage of the existing demands but do not serve as the source of expanding new demands. This implies that increased output invariably means a lower price in the sense that there is a downward shift along the market's demand curve (Squire, 1981); and
- there is likely a threshold involved in the high costs of shifting to formal work arrangements and to the protection required for an expanding formal activity.

These in-built disadvantages can perhaps be overcome by initiating and implementing an effective support strategy (Naude and Anand, 1999).

REFERENCES

- Aiginger, K. and G. Tichy, (1991). "Small Firms and the Merger Mania". *Journal of Small Business Economics* 3.

- Anand, Vinod and Nur, El-Tahir Mohammad, (1985). The Role of Small Enterprises in Developing Countries: A Case Study of Wad Medani in Sudan. *Asian Economic Review*, Vol. 27, No. 1/2, April /August, Mimeographed.
- Anand, Vinod K., (1991). *Small Enterprises and Urban Economy*, Allahabad: Chugh Publications.
- Anand, Vinod K., (1996). "On New Political Economy: An Overview", *The Indian Journal of Economics*, Vol. LXXVII, Part II, No. 305, October, University of Allahabad, India
- Anderson, Dennis, (1982), "Small Industry in Developing Countries: Some Issues", World Bank Staff Working Paper No. 518, Washington D.C
- Anderson Dennis and Khambata, Farida. (1982). "Financing Small-Scale Industry and Agriculture in Developing Countries: The Merits and Limitations of Commercial Policies", World Bank Staff Working Paper No. 519 (May), Washington, D.C.
- Anderson, Dennis and Khambata, Farida (1981). "Small Enterprises and Development Policy in the Philippines: A Case Study", World Bank Staff Working Paper No. 468(July) Washington, D.C.
- Arghiros, D. (1997). "Rural Industry and Development in Central Thailand: An Alternative Approach", *The Journal of Entrepreneurship*, Vol. 6, No. 1, January-June.
- Aubrey, H.G., (1951). *Small Industry in Economic Development*, Social Research, September.
- Beneria, Lourdes, and Roldan, Martha. (1987). "The Crossroads of Class and Gender: Industrial Homework, Subcontracting, and Household Dynamics in Mexico City", *Women in Culture and Society Series*, University of Chicago Press, Chicago and London.
- Berna, J.J., (1960). *Industrial Entrepreneurship in Madras State*, Stanford Research Institute, California, and Asia Printing House, New Delhi.
- Bernal, Victoria (1991). *Cultivating Workers: Peasants and Capitalism in a Sudanese Village*, Columbia University Press, New York.
- Birch, D.L. (1982). *The Job Generation Process*, The MIT Press, Boston.
- Bjorkman, James-Warner, ed. (1986). *The Changing Division of Labour in South Asia: Women and Men in India's Society, Economy, and Politics*, Riverdale.
- Broom, M and Joyce-Clarke, Carolyn, (1990). A Retail Perspective of the Informal Sector, *South African Journal of Economics*, 58(4), December, University of Capetown.
- Buvinic, Mayra (1989). *Investing in Poor Women: The Psychology of Donor Support*, World Development, 17(7), July.
- Cecora, James (1991). "The Role of Informal Activity in Household Economic Behaviour," *Beitrag zur Okonomie von Haushalt und Verbrauch*, Heft 22, Duncker and Humbolt, Berlin.
- Clark, Gracia, ed. (1988). *Traders Versus the State: Anthropological Approaches to Unofficial Economies*, Westview Special Studies in Applied Anthropology Series, Boulder, London, Westview Press
- Coase, R.H., (1937). "The Nature of the Firm", *Economics N.S.* 4, pages 386-405
- Cole, William E., and Fayiaa, Bichaka, (1991). "The Urban Subsistence Labor Force: Toward a Policy-Oriented and Empirically Accessible Taxonomy, *World Development*, 19(7). July

- Danesh, Abol-Hassan (1991). *Research and Information Guides in Business, Industry, and Economic Institutions*, Volume 2, Garland Reference Library of Social Science, Vol. 624, New York and London: Garland.
- Dhar, P.N., and Lydall, H.F., (1961). *The Role of Small Enterprises in Indian Economic Development*, Asia Publishing House, New York.
- Drakakis-Smith, David, ed. (1990). *Economic Growth and Urbanization in Developing Areas*, London and New York: Routledge.
- Feige, Edgar-L. (1990). "Defining and Estimating Underground and Informal Economies: The New Institutional Economics Approach", *World Development*, 18 (7) July.
- Gang, Ira-N., Gangopadhyay, Shubhashis (1990). "A Model of the Informal Sector in Development", *Journal of Economic Studies*, 17 (5).
- Girling, J., (1996). *Interpreting Development: Capitalism, Democracy and the Middle Class in Thailand*, Cornell University press, Ithaca
- Goodman, E. and Bamford, J. (eds.) (1989). *Small Firms and Industrial Districts in Italy*, Routledge, London.
- Haltiwanger, D. and Schub, S. (1996). *Job Creation and Destruction*, The MIT Press, Boston
- Hewison, K., ed., (1997). *Political Change in Thailand; Democracy and Participation*, Routledge, London.
- Hoselitz, B.F., (1959). *Small Industry in Underdeveloped Countries*, *Journal of Economic History*, Vol. 19. Reprinted in *Development Economics and Policy*, Ian Livingston (Ed.), Allen and Unwin, 1980.
- Hymer, Stephen and Rensick, Stephen (1969). "A Model of an Agrarian Economy with Non-Agricultural Activities", *American Economic Review*, 59, 3.
- International Labour Office, (1972). *Employment, Incomes, and Equality: A Strategy for Increasing Productive Employment in Kenya*; also printed in *Leading Issues in Economic Development*, Gerald M. Meier, Oxford University Press, pages 183-190, 1984.
- Kilby, Peter, (1962). *The Development of Small Industry in Eastern Nigeria*, Ministry of Commerce, US Agency for International Development.
- Levy, B., (1993). "Obstacles to Developing Indigenous Small and Medium Enterprises: An Empirical Assessment." *The World Bank Economic Review*. 7:1
- Levy, David T. (1984). "Testing Stigler's Interpretation of the Division of Labor is Limited by the Extent of the Market", *The Journal of Industrial Economics* 32.
- Liedholm, Carl and Mead, Donald C. (1999). *Small Enterprises and Economic Development: The Dynamics of Micro and Small Enterprises*, Routledge, London and New York.
- Liedholm, Carl and Mead, Donald C. (1988). "Small Scale Enterprises: A Profile", *Economic Impact*, No. 63, USIS, USA, Washington, D.C.
- Marsden, Keith., (1990). "African Entrepreneurs: Pioneers of Development", *International Finance Corporation, Discussion Paper Number 9*, The World Bank, Washington, D.C.
- Mead, Donald C. (1994). "The Contribution of Small Enterprises to Employment Growth in Southern and Eastern Africa" *World Development*, Vol. 22, No. 12.

- Meier, Gerald M., ed., (1984). *Leading Issues in Economic Development*, Oxford University Press, New York.
- Muscat, R. (1996). *Development Strategy in Thailand: A Study of Economic Growth*, New York, Praeger.
- Naude, W.A., Anand, V.K., (1999). South Africa-Netherlands Research Programme on Alternative Approaches to Development (SANPAD): Manufacturing Survey of North West Province of South Africa. First Annual Report, December, Mimeographed. See Appendix F: "Promoting Small-Scale Manufacturing in the North-West Province of South Africa" by Anand, V.K., Pages 130-38.
- Nooteboom, Bart (1993). "Firm Size Effects on Transaction Costs", *Small Business Economics*, Volume 5, No. 4, December, Kluwer Academic Publishers, Netherlands.OK
- Pack, Howard, (1978). *Macroeconomic Implications of Factor Substitution in Industrial Processes*, Washington, D.C. : World Bank.
- Page, John M., Jr., (1979). "Small Enterprises in African Development: A Survey". World Bank Staff Working Paper No. 363 (October).
- Parnwell, M. (1996). *Uneven Development in Thailand*, Avebury Press, Aldershot.
- Penrose, E. (1980). *The Theory of the Growth of the Firm*, Basil Blackwell Publishers, Oxford.
- Peattie, L., (1987). "An Idea in Good Currency and How It Grew: The Informal Sector", *World Development*, 15:7, July.
- Regnier, Philippe (2000). *Small and Medium Enterprises in Distress: Thailand, the East Asian Crisis and Beyond.*, Gower Publishing, England, pp.8-9.
- Romatet, Emmanuel. (1983). *Calcutta's Informal Sector: Theory and Reality*, *Economic and Political Weekly*, Vol. XVIII, No. 50, December 10.
- Rothwell, R., (1985). "Innovation and the Smaller Firm", First International Technical Innovation and Entrepreneurship Symposium, Utah Innovation Foundation, Salt Lake City, 11- 13 September.
- Servon, Lisa J, and Bates, Timothy. (1998). "Micro enterprises as an Exit Route from Poverty: Recommendations for Programs and Policy Makers". *Journal of Urban Affairs*, Vol.20, Issue 4.
- Squire, L, (1981). *Employment Policy in Developing Countries: A Survey of Issues and Evidence*, Oxford: Oxford University Press.
- Staley, E., and Morse, R., (1965). *Modern Small Scale Industry for Developing Countries*, McGraw-Hill.
- Stigler, George J. (1968). 'The Division of Labor is Limited by the Extent of the Market', reprinted in Stigler, *The Organization of Industry*, Homewood: Richard D. Irwin, Inc.
- Thomas, J.J., (1992). *Informal Economic Activity*, Hemel Hempstead, Harvester Wheatsheaf.
- Truu, M.L and Black, P.A., (1980). *The Urban Informal Sector and Market Imperfections*, *The South African Journal of Economics*. (48) March.
- White, Lawrence, J., (1978). "Appropriate Factor Proportions for Manufacturing in Less Developed Countries: A Survey of the Evidence", *Economic Development and Cultural Change*, 27, 1.

Williamson, O.E., (1975). *Markets and Hierarchies: Analysis and Antitrust Implications*, New York: Free Press.

Williamson, O.E., (1985). *The Economic Institutions of Capitalism: Firms, Markets, Relational Contracting*. New York: the Free Press. OK

World Bank, (1978a). *Rural Enterprises and Non-Farm Employment*, A World Bank Paper.

World Bank, (1978b). *Employment and Development of Small Enterprises: A Sector Policy Paper*.

Non-frontier profit function : An application to indian agriculture*

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Abstract

As an alternative to the "Frontier" function approach for studying efficiencies of production units, this paper discusses the use of a *non-frontier approach* termed as "Restricted Profit Function" (RPF) Approach by Kumbhakar (1993). This approach assumes that firms maximize profit with implicit restrictions. We have tried, in this paper, to modify this approach by introducing certain changes that seem to be relevant from the methodological point of view.

I. Introduction

In examining efficiency of production units one of the following two approaches is usually taken: (i) Data Envelopment Approach (DEA) involving mathematical programming techniques, and (ii) an Econometric Approach (EA) based on some functional specifications. The econometric approach might involve a frontier or a non-frontier analysis. In the frontier approach, a production unit optimizes a behavioural goal, such as cost or production or profit or revenue, subject to the appropriate constraints on quantities or prices. The optimum function thus arrived at is known as a *frontier function*. Such a function may be deterministic or stochastic. In the case of a deterministic frontier, no noise variable is added to the frontier function. A stochastic frontier, however, makes explicit recognition to some random events (like machine or equipment failures, product defects, etc.), which are outside the control of the producer. In both the cases, indices of efficiency are measured with reference to the relevant frontier functions. In the non-frontier approach efficiency of a production unit is compared with another unit but not compared with the optimal one. The frontier function has no role in this comparison and thus this approach can be termed as a *non-frontier approach*. (Hopper (1965); Lau and Yotopoulos (1971, 1979); Yotopoulos and Lau (1973); Toda (1976); Lovell and Sickles (1983); Atkinson and Halvorsen (1986); Hollas and Stansell (1988); Eakin and Kniesner (1988)).

There may be different types of non-frontier techniques depending on the farmer's objective function. An example of a non-frontier technique is the profit function technique where a farmer is assumed to maximize profit (Sen 1975).

Kumbhakar (1998) suggested a new non-frontier technique, called the "Restricted Profit Function" (RPF) method, which incorporates specific features

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and characteristics of a developing economy while analyzing farm efficiency of Indian farmers. According to the RPF method farmers are assumed to maximize their profit subject to certain constraints. The constraints include social, cultural and political factors (such as government controls, land tenancy rights, etc.) which operate at an aggregative or macro level and not specifically at the level of individual farms. The impact of the presence of such constraints does not appear explicitly and separately in the profit function but is captured by a blanket specification of a variable representing the combined effect. It is through this variable that the combined effect of such constraints are internalized by the farmers in their optimization processes. In this process, the so-called efficiency indicator advanced by marginalist theorists (i.e., value of marginal product of an input = input price) gets distorted. Instead, what one gets is the equality of marginal product of an input to a parameter that includes price. This parameter is called the shadow price. The ratio of actual price to shadow price gives the measure of allocative efficiency.

The use of **RPF** approach is essential for estimating allocative efficiencies without taking help of simultaneous equations that are usually assumed in the Frontier Production Function (**FPF**) approach. For estimating technical efficiency, however, one has to take the Deterministic Frontier Function (**DFF**) approach. In any case, both allocative and technical efficiencies are determined from the same equation.

The RPF technique, after some modifications, has been used in this paper to study some implications of farm efficiency on the basis of 597 paddy cultivating households in West Bengal for the year 1989 – 90. We prefer this modification over the usual RPF method of estimating efficiency for the reason that this technique makes it possible to consider some elements of the economic environment in which a farmer has to take his decision, in a more explicit way than the RPF criterion.

The paper is divided into six sections. Section II deals with the model specification and derivation of allocative efficiency, used in studying farm efficiency in the context of Indian agriculture. Section III depicts the approach to estimate technical efficiency. Section IV presents some descriptions of the data used and the methodology followed for estimation. Section V provides some empirical results, and Section VI draws some concluding observations.

II Model Specification and Allocative Efficiencies

It is generally argued, under RPF, that two types of inputs are used by the farms in the production process, viz., ‘quasi-fixed’ and ‘variable’. Quasi-fixed inputs include those inputs which are owned by the farmers themselves and hence have no observable market prices (e.g., family labour, owned bullock labour, etc.). Variable inputs are bought from the market and they have observable market prices (e.g., hired labour, fertilizer, etc.).

It is assumed that the typical farmer faces an identical production function of the standard neo-classical type:

$$y = f(\bar{x}, \bar{z}) \quad (1)$$

where y is the level of output and \bar{x} and \bar{z} are the vectors of variable and quasi-fixed inputs respectively.

The farmer's objective is:

$$\max \varphi = y - w'\bar{x} \quad (2)$$

$$\text{subject to : } R_s(y, \bar{x}, \bar{z} | p, w) = 0, s = 1, 2, \dots, S.$$

where w' is the vector of variable input prices per unit of output price p , φ is the level of profit per unit of output price¹. $R_s(\dots)$ denotes the S constraints that are internalized by the farmers themselves (e.g., govt. controls, land tenancy rights, etc.)².

The first order condition corresponding to the optimization problem in (2) is :

$$F_i = w_i + \sum_s \lambda_s \frac{\partial R_s(\dots)}{\partial x_i} \equiv w_i^* \quad (3)$$

where $F_i = \frac{\partial y}{\partial \bar{x}_i}$ and λ_s be the Lagrange multiplier associated with the s th

constraint in (2) and w_i^* is defined as the shadow price of the i th input.

The shadow profit i.e., profit in terms of shadow price may be written as :

$$\varphi^* = \varphi^*(w^*, \bar{z}) \quad (4)$$

From above, the following relationship was drawn by Kumbhakar (1998) :

$$w_i^* = \theta_i w_i \quad (5)$$

where w_i is the actual price, w_i^* is the shadow price, and θ_i denotes the degree to which the optimality condition is achieved by the farmers with respect to all the inputs. Assuming the non-negative marginal productivities of the variable inputs, θ_i s are necessarily non-negative. In fact, this θ_i provides a measure of allocative efficiency. To be more precise θ_i measures the allocative inefficiency of the i th input. Observe that since the shadow price w_i^* may be greater, equal or less than the i th input price w_i , θ_i may be greater, equal or less than '1'. Thus $\theta_i > 1$ means i th input is inefficiently used, i.e., it is used in such a way that it costs more than actual prevailing market price.

Now to estimate θ_i , the following relationship between actual profit (φ^a) and shadow profit (φ^*) was established by Kumbhakar (1998) :

$$\ln \varphi^a = \ln \varphi^* + \ln M \quad (6)$$

$$\text{where } M = 1 + \sum_{i=1}^n S_i^* (1 - \theta_i) / \theta_i$$

$$\text{and } S_i^* = \frac{\partial \ln \varphi^*}{\partial \ln w_i}$$

For specifying the shadow profit function a translog form of φ^* is usually used since this can take into account the first and second order effects of input prices and quasi-fixed inputs. The production function can then be specified as:

$$\begin{aligned} \ln \varphi^* = & a_0 + \sum_{i=1}^n \beta_i \ln w_i^* + \sum_m \gamma_m \ln \bar{z}_m \\ & + \frac{1}{2} \sum_i \sum_j \beta_{ij} \ln w_i^* \ln w_j^* + \frac{1}{2} \sum_i \sum_m \delta_{im} \ln w_i^* \ln \bar{z}_m \quad (7) \end{aligned}$$

From the theory of production function, it is clear that there are certain homogeneity restrictions which the function (7) should satisfy. Coelli, Rao and Battese (1998) in this context argued that "these restrictions are most easily imposed by normalizing the output and the inputs by dividing them all through by one of the inputs. Results will be invariant to the choice of this input" (P. 236). The only explicit restriction seems to be the symmetry restriction $\beta_{ij} = \beta_{ji}$.

In the translog function specified above, it is difficult to identify the individual parameters θ_i s. This is easily established if we write (7) as :

$$\begin{aligned} \ln \varphi^* = & a_0 + \sum_{i=1}^n \beta_i^* \ln w_i + \sum_m \gamma_m^* \ln \bar{z}_m \\ & + \frac{1}{2} \sum_i \sum_j \beta_{ij}^* \ln w_i \ln w_j + \frac{1}{2} \sum_i \sum_m \delta_{im}^* \ln w_i \ln \bar{z}_m \quad (8) \end{aligned}$$

Where :

$$a_0^* = a_0 + \sum_i \beta_i \ln \theta_i + \frac{1}{2} \sum_i \sum_j \beta_{ij} \ln \theta_i \ln \theta_j \quad (9a)$$

$$\beta_i^* = \beta_i + \sum_j \beta_{ij} \ln \theta_j, \text{ since,} \quad (9b)$$

$$\beta_{ij} = \beta_{ji}$$

$$\gamma_m^* = \gamma_m + \frac{1}{2} \sum_i \delta_{im} \ln \theta_i \quad (9c)$$

$$\beta_{ij}^* = \beta_{ij} \quad (9d)$$

$$\delta_{im}^* = \delta_{im} \quad (9e)$$

Clearly, there is no way of identifying the parametric values of θ_i s from these relationships.

Moreover, in this approach, all possible direct and secondary effects of the quasi-fixed and variable inputs on the level of output have been considered important. However, we feel that such a consideration is rather mechanical as it tends to neglect certain important aspects of the farmer's decision making process. Since production decisions are normally guided by the short-period considerations, the influence of the variable factors seems to be more important than the quasi-fixed inputs in the profit function. Quasi-fixed factors come into the picture only as imperfect substitutes of the relevant variable factors (such as family labour is a substitute of hired labour, owned bullock is a substitute of hired bullock etc.). In fact, the incidence of quasi-fixed inputs in the production process is captured by the coefficients of cross-effects between the shadow prices and quasi-fixed inputs on the shadow profit itself.

The following modification of the translog profit function specified in (7) is thus called for:

$$\begin{aligned} \ln \varphi^* = & a_0 + \sum_{i=1}^n \beta_i^* \ln w_i^* + \frac{1}{2} \sum_i \sum_j \beta_{ij} \ln w_i^* \ln w_j^* \\ & + \frac{1}{2} \sum_i \sum_m \delta_{im} \ln w_i^* \ln \bar{z}_m \end{aligned} \quad (10)$$

From the pure econometric point of view, use of translog function of the type (7) imparts flexibility in functional form absent in the specification (10), since (10) does not include the linear terms involving \bar{z}_m s. It also leads to a specification bias. However, this is not a serious problem, since the values of the coefficients γ_{ms} in (7) are rather small. Further, if we express (10) in terms of actually observed input prices (as in (12) below) a linear terms involving \bar{z}_m s reappear.

The Modified Translog Function (MTF) may be used for empirical estimation of the coefficients of allocative efficiency of inputs (θ_i s). However, for this estimation we need to derive certain standard relationships between shadow profit (φ^*), actual profit (φ^a) and total of differences between actual and shadow input costs (A).

For this purpose, from equation (6), we can derive the following relationship between actual profit (φ^a) and shadow profit (φ^*):

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Propositon 1

$$\ln \varphi^* = \ln(A + \varphi^a) \quad (11)$$

$$\text{where } A = \sum_{i=1}^n (1 - \theta_i) w_i x_i$$

Proof:

Denoting $S_i = \frac{w_i x_i}{\varphi^a}$ i.e., the share of the i^{th} input in actual terms, Kumbhakar (1998) derived the share equation as follows:

$$-S_i = -\frac{w_i x_i}{\varphi^a} = \frac{S_i^*}{\theta_i M}$$

Using this relationship in the expression of M given in (6) we get:

$$-\sum \frac{(1-\theta_i)}{\theta_i} \frac{w_i x_i}{\varphi^a} (\theta_i M) = M - 1$$

or,

$$-\sum (1-\theta_i) w_i x_i \frac{M}{\varphi^a} = M - 1,$$

which gives

$$\frac{M}{\varphi^a} = \frac{1 - M}{\sum (1 - \theta_i) w_i x_i}$$

Hence,

$$\frac{M}{\varphi^a} + \frac{M}{\sum (1 - \theta_i) w_i x_i} = \frac{1}{\sum (1 - \theta_i) w_i x_i}$$

That is,

$$\frac{M}{\varphi^a} + \frac{M}{A} = \frac{1}{A},$$

From this it follows that $M = \frac{\varphi^a}{\varphi^a + A}$

Therefore,

$$\ln \varphi^a = \ln \varphi^* + \ln \varphi^a - \ln(A + \varphi^a)$$

$$\text{or,} \quad \ln \varphi^* = \ln(\varphi^a + A)$$

The parameter A indicates the difference between the total input cost in terms of market prices and that in terms of shadow prices. Evidently, if a farm is perfectly efficient (*i.e.*, $\theta_i = 1 \forall_i$) this difference becomes zero.

The relationship derived in (11) between shadow profit (φ^*) and actual profit (φ^a) is the basis of an algorithm that can be used in estimating the values of the parameters ($\theta_{i,s}$). This algorithm is based on: (a) the profit function postulated in (10) and (b) the number of inputs used. From (10) it can be shown that:

$$\begin{aligned} \ln \varphi^* &= a_0 + \sum_{i=1}^n \beta_i^* \ln w_i + \frac{1}{2} \sum_m \gamma_m^* \ln \bar{z}_m \\ &+ \frac{1}{2} \sum_i \sum_j \beta_{ij}^* \ln w_i \ln w_j + \frac{1}{2} \sum_i \sum_m \delta_{im}^* \ln w_i \ln \bar{z}_m \end{aligned} \quad (12)$$

where:

$$a_0^* = a_0 + \sum_i \beta_i \ln \theta_i + \frac{1}{2} \sum_i \sum_j \beta_{ij} \ln \theta_i \ln \theta_j, \quad (13a)$$

$$\beta_i^* = \beta_i + \sum_j \beta_{ij} \ln \theta_j, \quad (13b)$$

$$\gamma_m^* = \sum_i \delta_{im} \ln \theta_i, \quad (13c)$$

$$\beta_{ij}^* = \beta_{ij}, \quad (13d)$$

$$\delta_{im}^* = \delta_{im}. \quad (13e)$$

It is possible to identify the values of $\theta_{i,s}$ if the number of quasi-fixed factors and the number of variable input prices are same *i.e.*, $n_1 = n_2^3$. This might appear to be a somewhat restrictive assumption. However, in the case of underdeveloped agriculture, major inputs might be categorized under substitutable variable and quasi-fixed input categories (such as hired labour and family labour, hired animal labour and owned animal labour, owned land and leased-in land, owned and hired machine labour, indigenous irrigation and modern costly irrigation etc.). As argued by Rudra (1992), farmers generally tend to substitute costly variable inputs by using quasi-fixed inputs.

In our exercise we have used only three quasi-fixed factors and variable input prices (*viz.*, family labour, owned bullock labour and seed as quasi-fixed and hired human labour, hired bullock labour and fertilizer as variable inputs while land cultivated was the *normalizing* factor).

We can now obtain an estimate of the unknown parameter vector $\bar{\theta}$. For this purpose the following algorithm is proposed:

Step 1: Let $A_j^{(r)}$ be the value of A of the j th farm in the r th iteration. The starting point is:

$$A_j^{(0)} = \sum_i w_i(j) \bar{x}_i(j).$$

Then we regress $(\log(\varphi_j^a + A_j^{(0)}))$ on $\ln w_i$,

$$[\ln(w_i)^2], (\ln w_i)(\ln w_j), (\ln w_i)(\ln \bar{z}_m)$$

and $\ln \bar{z}_m$ to estimate a^* , β^*s , β_{ij}^*s , δ_{im}^* and γ_m^*s .

Step 2: Now we use the relationship (13c) and (13e) to estimate $\theta_i^{(0)}$.

Step 3: Next, we compute the values of A_j s in the second iteration as follows:

$$A_j^{(1)} = \sum_i (1 - \theta_i^{(0)}) w_i(j) \bar{x}_i(j).$$

We use this in regression to get estimates of $\theta_i^{(1)}s$.

The process continues until, successive values of θ_i differ from each other by less than some preassigned small value, ϵ .

It can be easily shown that the parameter values obtained from the above algorithm will always converge. This follows from a result due to Dhrymes (1978) (pp. 344 – 347) which ensures that the likelihood function $L(\bar{\theta})$ will always

converge irrespective of the initial values provided that the matrix $\frac{\partial^2 \ln L}{\partial \bar{\theta} \partial \bar{\theta}'}$ is

negative-definite for all values of $\bar{\theta}$. Hence, the initial values of the parameters do not matter so far as the convergence is concerned. However, careful choice of initial parameter values might reduce the number of iterations considerably. Thus, the above modification helps to sort out the problems usually faced in this type of non-frontier approach.

III Technical Efficiencies

The technical inefficiency can be introduced by incorporating the equation error τ such that

$$\ln \varphi^a = \ln \varphi^* + \ln M + \tau \quad (14)$$

where τ is non-positive and can be interpreted as the reduction in the

logarithm of the profit due to technical inefficiency. This is necessarily a DFF approach. So far as technical efficiency is concerned there is little difference between DFF and our approach. The only difference is that the frontier function (14) is a *shadow profit function* which incorporates the shadow prices. It is, in fact, different from the standard profit frontier function.

For the purpose of estimation of technical efficiency, we considered a linearized form of $\ln M$. We have already described the estimation procedure of the $\theta_{i,s}$ involving the method of search procedure. It is now easy to estimate the technical efficiency by incorporating these values of $\theta_{i,s}$ in (9) with a linearized form of $\ln M$. To do this, we have applied the Modified Corrected Ordinary Least Squares (MCOLS) technique. The technique was first developed by Richmond (1974). It essentially involves an estimation of the equation (9) by OLS and then shifting of the estimated regression equations in a way that all errors become one-sided⁴. The difference between the expected value of the dependent variable and the observed value gives the measure of technical efficiency. In our case, however, we have considered the exponential of this difference. We get a measure of technical efficiency for each of the sample farms. We have then tried to estimate the mean technical efficiency for the farms belonging to each of the size group. From the distribution of technical efficiency of individual farms, we have also tried to test the nature of the relationship that prevails between the size of a farm and its technical efficiency by following the Pearson's X^2 test of independence.

IV Data and Methodology

The data we used for our empirical analysis were collected by the Ministry of Agriculture, Government of India through the "Comprehensive Scheme for Studying Cost of Cultivation" (CSSCC). We have used in this study farm-level disaggregated data pertaining to the year, 1989 - 90 for West Bengal. It may be noted in this context that the non-availability of farm-level data is the major problem of such kind of analysis. In fact, the present study is based on relatively old (1989 - 90) farm level cross-section data. For a more rigorous analysis, data for more time points and of more recent years might have been useful. Unfortunately, we have not been able to have access to such data. The present exercise, however, may serve to verify the soundness of the methodology adopted here relating to farm efficiency in Indian agriculture.

Our sample is characterized by some specific socioeconomic features which may be observed from the following distribution of size-class of operational holdings. Out of 597 paddy cultivating households, 210 have net cultivated area not exceeding 1.00 hectares, 212 within the range 1.00-2.00 hectares, 95 within the range 2.00-3.00 hectares, while only 80 have net cultivated area exceeding 3.00 hectares. Out of these 80 households only 21 households possess operational holdings more than 4 hectares and above (not shown in the table). We have not separated out this largest group in our study as the sample sizes are very small.

From this distribution, it is clear that the predominance of small peasants is a unique feature of West Bengal agriculture. Similar observations were made by some earlier authors. It has been shown that the growth of small farms is very high compared to the large farms in West Bengal and the composition of farms are heavily tilted towards the small peasants (Rudra 1982). Given this background, it would be interesting to examine empirically the efficiency of different types of farmers in West Bengal agriculture.

As discussed earlier, the empirical exercise requires the estimation of the allocative efficiency parameters θ_s and the technical efficiency parameter $\exp(\tau)$ using the non-frontier profit function postulated in (10). We have considered only three quasi - fixed factors - family labour, owned bullock labour and seed⁵ and three variable factors- hired human labour, hired bullock labour and fertilizer. Land cultivated was treated as a quasi-fixed factor in our model since most of the farms in our sample are owner-cultivators (about 94.81%). For the purpose of estimation, it is necessary to restrict our sample farms to those using positive amount of these six factors. In our case only 362 farms use positive amount of these inputs.

Once we get the values of the parameter θ_s , we can proceed on to calculate the values of $\exp(\tau)$ by following the MCOLS method described earlier. The technical inefficiency measure for a particular group of farmers can be regarded as the degree of technical inefficiency exhibited by the farmers when they all suffer from an average allocative inefficiency.

We may now turn to the results of our analysis presented in the following section.

V Empirical Results

Table 1 presents some indicators of farm economics for all the size groups of paddy cultivating households in the sampled villages of West Bengal for the year, 1989 - 90. The table shows that output per hectare of cultivated area decreases with increase in farm size. On the contrary, 'profitability' per hectare which is defined by Sen (1975) as the surplus of output over costs, including the imputed value of labour, increases with increase in farm size. These two results together are in conformity with the observations made by Sen (1975) in connection with the labour use and productivity relation in Indian agriculture at least at the aggregated farm-level data. Moreover, we find in a separate calculation (not shown in Table 1) that out of 597 farms about 24.3% are non-remunerative farms (i.e., farms having zero or negative profit). This also supports Sen's (1975) another observation: "When family labour employed in agriculture is given an 'imputed value' in terms of the ruling wage rate, much of the Indian agriculture seems unremunerative" (p 147). The above findings seem to indicate a basic structure of the Indian farm economy: that is, large farms have comparative advantage over the small farms in respect of all the non-labour monetized inputs.

It is only in the use of the family labour that the small farms have some advantage and hence this input should not be valued at the market wage rate. Table 1 clearly shows that the productivity of labour in terms of man-hours declines as the size increases.

We may now turn to examine the allocative efficiency of different categories of farmers, using various types of input with different intensity and obtaining different levels of output. It may be noted in this context that we have considered in our analysis only three inputs - hired human labour, hired bullock labour and fertilizer. In Table 2 we present the results of our analysis indicating the values of the efficiency parameters θ_i s (representing the ratio of shadow price and actual market price of the i^{th} input) for all the inputs under study as well as for various size groups of farms.

Considering the use of the same inputs by the various groups of farms, we find that the farms belonging to the lowest size group (i.e., up to 1.00 hectare) typically use all the inputs more efficiently than the larger size group (i.e., above 3.00 hectares). On the other hand, the average level of technical inefficiency has been found to be very low for the highest size group. This means that the very large size farms are more technically efficient.

Coming now to the frequency distribution of farms belonging to different levels of technical efficiency, we find from Table 3 that most of the farms belong to the level of efficiency groups ranging between 30% - 60%. In order to identify technically efficient or near - efficient peasants, a size-class distribution of farms in terms of the different levels of technical efficiency may be relevant. Table 4 shows a bivariate frequency distribution between the size groups and the levels of technical efficiency. From this table, we have calculated the relevant Pearson's X^2 to examine the mutual interdependence between the size group and the level of technical efficiency. However, since some of the cell frequencies are very low, we had to merge some of the classes. The calculated X^2 is 19.838 with 12 degrees of freedom. Hence there appears to be no statistically significant differences in technical efficiency between the various groups of farms and the distribution of technical inefficiency seems to be independent of the size groups of farms at both 5% and 1% level. Our findings thus support the findings of some earlier studies (Kumbhakar and Bhattacharya 1992; Sidhu 1974; Sidhu and Baanante 1979) where it has been observed that there exists no significant difference between technical efficiencies of different size groups of farms.

V Concluding Observations

In this paper, we analyzed the problems of allocative and technical efficiency of farms using the non-frontier profit function technique in the context of Indian agriculture. The basic model with which we are attempting to analyze and interpret the farm efficiency of Indian farmers assumes that the farmers are to a great extent, influenced by certain elements of the economic environment which act as a constraint in their efforts towards maximizing profit. This constraint

particularly affects the decision-making behaviour of the farmers. Such influences cause a distortion in the allocative pattern suggested by the marginalist school. We have attempted here to develop a technique which could assess this distortion and judge its intensity for a variety of farm size groups, based on size of operational holdings. Our empirical exercise suggests that the farmers belonging to the smaller size groups are more allocatively inefficient than those of the largest group. This is however not so clear for the intermediate size groups. If we look at all the farms together we find a degree of independence between size and technical inefficiency.

However, one must be very careful before drawing any firm conclusion from this model. This is because, in this model, the form of the constraint that the farmers face is not specified. It is assumed that the farmers internalize this constraint in their optimization procedure. In effect, we assume that vector $\bar{\theta}$ is determined in a way so that the farmers' optimizations are achieved. This is a very strong assumption indeed.

A better procedure would be to specify the constraints explicitly. Färe and Logan (1983) have attempted to study efficiency by explicitly modeling the constraints in a case where firms are faced with "rate of return regulation" constraint whereby a firm is not allowed to earn more than a prespecified rate of return on the capital invested. However, as pointed out by Lovell (1993), this might not always be feasible. Lovell (1993) argued that in certain situations, "the researcher does not know the constraints or the objective of the producers, perhaps because there are competing paradigms at hand" (Pg. 43). Moreover indirect specification may lead to gross error in the result. In such cases, the shadow price technique might be preferred.

NOTES

1. In fact, $w_i = W_i / p$ where W_i is the price of the i^{th} variable input and w_i is the price of i^{th} variable input per unit of p . In the non-frontier literature, w_i is denoted as the normalized input price.
2. Kumbhakar and Bhattacharya (1992) pointed out a number of factors that might be included in R_i . They argued that a typical farmer in an underdeveloped economy like India might face a regulated fertilizer market (intervention by the government in setting prices), regulated land management system, forward contracts in input purchase and output sale, and output levy and support prices for output and labour.
3. This is obviously a necessary but not sufficient condition. Sufficiency requires non-singularity of the relevant matrix.
4. In Ordinary Least Squares (OLS) the regression errors can take negative, zero or positive values i.e., they are two-sided. In the frontier functions estimated by MCOLS method these errors can either take only non-negative or non-positive values i.e., they are one-sided. This technique

thus makes no assumption regarding the error specifications. Hence it is much more flexible than other methods where it is necessary to specify the probability distribution of the errors concerned.

5. "Land cultivated" has also been taken as a quasi-fixed input. This, however, has been used to normalize other variables. Thus the original function was assumed to be homogeneous of degree one.

Reference

- Atkinson, S.E., and R. Halvorsen (1986), "The Relative Efficiency of Public and Private Firms in a Regulated Environment: The Case of U.S. Electric Utilities", *Journal of Public Economics*, 29.
- Coelli, T., D.S.P. Rao and G.E. Battese (1998), *An Introduction to Efficiency and Productivity Analysis*, Kluwer Academic Publishers, Boston/Dordrecht/London.
- Dhrymes, P.J. (1978), *Introductory Econometrics*, Springer Verlag, New York.
- Eakin, B.K. and T.J. Kniesner (1988), "Estimating a Non-minimum Cost Function for Hospitals", *Southern Economic Journal*, 54.
- Hollas, D.R., and S.R. Stansell (1988), "An Examination of the Effect of Ownership Form on Price Efficiency: Proprietary, Cooperative and Municipal Electric Utilities", *Southern Economic Journal*, 55.
- Hopper, W.D. (1965), "Allocative Efficiency in a Traditional Indian Agriculture", *Journal of Farm Economics*, 47.
- Kumbhakar, S.C. (1998), "Efficiency Measurement Using Stochastic Frontier and Non-Frontier Models: A Survey of Methods and Applications to Indian Agriculture" in Chakravarty, S.R., D. Coondoo, and R. Mukherjee (edited) *Quantitative Economics: Theory and Practise, Essays in Honour of Professor N. Bhattacharya*, Allied Publishers, New Delhi.
- Kumbhakar, S.C., and A. Bhattacharya (1992), "Price Distortions and Resource Use Efficiency in Indian Agriculture: A Restricted Profit Function Approach", *Review of Economics and Statistics*, 74.
- Lau, L.J., and P.A. Yotopoulos (1971), "A Test of Relative Efficiency and Application to Indian Agriculture", *American Economic Review*, 61.
- Lovell, C.A.K. (1993), "Production Frontiers and Productive Efficiency", in Fried H.O., C.A.K. Lovell, and S.S. Schmidt (eds.), *The Measurement of Productive Efficiency*, New York: Oxford University Press.
- Lovell, C.A.K., and R.C. Sickles (1983), "Testing Efficiency Hypothesis in Joint Production: A Parametric Approach", *Review of Economics and Statistics*, 65.
- Richmond, J. (1974), "Estimating the Efficiency of Production", *International Economic Review*, 15.
- Rudra, A. (1982), *Indian Agricultural Economics: Myths and Realities*, Allied Publishers, Calcutta.
- Rudra, A. (1992), *Political Economy of Indian Agriculture*, K.P. Bagchi and Company, Calcutta.



- Sen, A.K. (1975), *Employment, Technology and Development*, Oxford University Press, London.
- Sidhu, S.S. (1974), "Relative Efficiency in Wheat Production in the Indian Punjab", *American Journal of Agricultural Economics*, 64.
- Shidu, S.S., and Baanante C.A. (1979), "Farm-Level Fertilizer Demand for Mexican Wheat Varieties in the Indian Punjab, *American Journal of Agricultural Economics*, 61.
- Toda, Y. (1976), "Estimation of a Cost Function When the Cost Is Not Minimum: The Case of Soviet Manufacturing Industries, 1958- 1971", *Review of Economics and Statistics*, 58.
- Yotopoulos, P.A., and L.J.Lau (1973), "A Test of Relative Efficiency: Some Further Results", *American Economic Review*, 63.

Table 1 : Some indicators of farm economics for the farms ranked according to size groups of operational holdings: West Bengal (1989-90)

INDICATORS	FARM SIZE GROUPS (IN HECTARE)				
	Upto 1.00	1.00 – 2.00	2.00 – 3.00	Above 3.00	All
(1)	(2)	(3)	(4)	(5)	(6)
$\frac{O}{A}$	8407.4	7842.9	7725.4	7304.6	7950.6
AP_i	2.8209	2.7367	2.7303	2.1778	2.7647
S	907.5	1075	1091.1	1519.6	1065.1
N	210	212	95	80	597

where

$\frac{O}{A}$ \equiv output per hectare

AP_i \equiv Average product of labour per hectare

S \equiv Surplus of output over total cost per hectare

N \equiv Number of farms.

Table 2 : Measures of allocative and technical inefficiency based on translog specification for the farms ranked according to size groups of operational holdings: West Bengal (1989-90).

ITEMS	FARM SIZE GROUPS (IN HECTARE)				
	Upto 1.00	1.00 – 2.00	2.00 – 3.00	Above 3.00	All
(1)	(2)	(3)	(4)	(5)	(6)
Allocative Inefficiency					
LABOUR	0.3667	0.7587	0.4616	1.8093	0.7609
B-LABOUR	0.3973	0.2141	0.6119	2.8181	0.7942
FERT	0.2107	0.1267	0.1908	0.8322	0.2978
Technical Inefficiency					
μ_{TE}	53.07	56.01	55.19	26.72	45.59
σ_{TE}	15.69	14.51	12.92	13.68	13.83
N_1	210	212	95	80	597
N_2	101	142	63	56	362

where

LABOUR \equiv Hired Human Labour

B-LABOUR \equiv Hired Bullock Labour

FERT. \equiv Fertilizer

μ_{TE} \equiv Mean of the Technical Inefficiency

σ_{TE} \equiv Standard deviation of the Technical Inefficiency

N_1 \equiv Total number of paddy cultivating farms

N_2 \equiv Total number of farms that use positive amount of all the quasi-fixed and variable inputs.

Table 3 : Frequency distribution of farms according to level of technical efficiency : West Bengal (1989-90)

Efficiency-level (%)	No. of farms	Percent of total
(1)	(2)	(3)
Upto 20	3	0.8
20.01 – 30.00	35	9.7
30.01 – 40.00	106	29.3
40.01 – 50.00	98	27.1
50.01 – 60.00	68	18.8
60.01 – 70.00	32	8.8
70.01 – 80.00	16	4.4
Above 80	4	1.1
TOTAL	362	100

Table 4 : Frequency distribution of farms according to level of technical efficiency and size group of farms : West Bengal (1989-90)

Efficiency-level (%)	No. of farms by size groups (in hectare)				
	Upto 1	1.00 – 2.00	2.00 – 3.00	Above 3.00	All
(1)	(2)	(3)	(4)	(5)	(6)
Upto 20	2	0	0	1	3
20.01 – 30.00	12	12	7	4	35
30.01 – 40.00	24	48	20	14	106
40.01 – 50.00	31	39	17	11	98
50.01 – 60.00	11	27	15	15	68
60.01 – 70.00	14	7	2	9	32
70.01 – 80.00	5	8	2	1	16
Above 80	2	1	0	1	4
TOTAL	101	142	63	56	362

Some Aspects of Institutional Credit - A Study of Rural West Bengal

Susmita Chatterjee*

Abstract

This paper seeks to examine the recent scenario of the institutional credit markets in rural West Bengal based on primary data collected from 400 households of Burdwan and Birbhum districts. For detailed understanding of the institutional credit arrangements in West Bengal countryside, the issues taken up for discussion are - participation of various categories of rural households in institutional credit markets, relative importance of different institutional credit agencies supplying credit in rural West Bengal, the determinants of rural households' access to institutional loan, terms and conditions of institutional credit, transaction cost and total cost of borrowing from institutional credit agencies, extent of institutional loan default and characteristics of the defaulters and finally, to examine whether there exists any 'credit gap' of institutional loans for various crops as well as for different categories of farming households.

Introduction

A well functioning rural credit market is indispensable for agricultural and rural development (Ramachandran & Swaminathan, 2002). However, the rural credit markets in India have been plagued by a number of problems historically some of which are the following: Firstly, in spite of several conscious attempts by the Governments in different points of time to increase the flow of the institutional credit in the rural areas, the supply of institutional loan has been generally inadequate. This is evident from some empirical studies based on rural West Bengal, which had shown that the institutional credit agencies are not the major sources of credit in the rural areas of the state. For example, Bhattacharyya (1997) studied the indebtedness of the rural households of Bankura district in 1993-94. His findings showed that only 37.67 per cent of total loan amount was supplied by the institutional credit agencies. A micro level study conducted in the district of North 24 Parganas of West Bengal in 1996-97 found that overall production credit received by the small and marginal farmers from the institutional sources could meet about 26 per cent of their total working capital requirement. Naturally they had to depend on the non-institutional sources for the rest 74 per cent of their working capital requirement (Samal, 2002). Bhaumik and Rahim (2004) found that only 33 per cent of the total amount borrowed by the sample households of their study villages in Hugli and Bankura districts of West Bengal was from institutional sources in 1991-92. Another study based on two villages of Bankura district of West Bengal showed that only 23.7 per cent of the total loan amount was borrowed from the institutional sources in 1995-96 (Rawal, 2005). Rural Labour Enquiries also provide data on the indebtedness of rural labour households. According to these data, in West Bengal, only about 40 per

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cent of the outstanding amount to the rural labour households was supplied by the institutional credit agencies in 1993-94 (*ibid*). Based on the above studies, we can say that the institutional credit agencies supply about 1/3rd of total loan requirements of the rural households.

Secondly, the affluent sections of the society benefited relatively more from whatever expansion in the institutional credit has taken place over the years. This is evident from the empirical study carried out by Rajeev & Deb (1998) in Hugli district of West Bengal. Their study revealed that the top 15 per cent of the farming households mops up 50 per cent of total institutional credit and the study concluded that the economically well-to-do farmers cornered the low interest bearing institutional loan. Another study based on 250 farm households of Sambalpur district in Orissa found that of the total institutional loan borrowed by the farming households, barely 1.19 per cent had been borrowed by the lowest farm size group which accounted for 24 per cent of the total sample. On the other hand, the highest farm size group, which accounted for only 12 per cent of the sample, obtained 44.38 per cent of total institutional loan. This suggests that institutional credit tends to gravitate towards the better off farmers (Sarap, 1991).

Finally, the rural credit markets in many areas have been imperfect and fragmented and as a result of such imperfection/fragmentation, the non-institutional lenders dominated in the markets for rural credit (Sarap, 1991; Ghate et al., 1992; Swaminathan, 1993; Jodhka, 1995; Rajeev & Deb, 1998; Bhaumik & Rahim, 2004; Chaudhuri, 2004). The situation appears to be one of 'duality' in the rural credit markets whereby both the institutional credit agencies (comprising the commercial banks, the co-operative banks, the regional rural banks and other financial institutions) and the non-institutional lenders (the village moneylenders, traders, input sellers, landlords, friends, relatives and so on) operate simultaneously in the rural areas.

This study on institutional credit arrangements in rural West Bengal has special significance. During the decades of 1970s and 1980s, along with other states, West Bengal also experienced substantial growth in rural banking infrastructure development as well as flow of credit to the rural areas. However, the percentage of credit disbursed by different institutional credit agencies in rural West Bengal remained lower than the all India average all through. The situation deteriorated with the introduction of new economic reforms policies in 1990s. The decade following the introduction of new economic reforms policies saw crippled banking in rural areas of the country as a whole but in case of West Bengal, the reforms meant a drastic reduction in the flow of institutional credit to the rural / agricultural sector and withdrawal of services by the institutional credit agencies (specifically commercial banks) from the countryside.¹

In the above backdrop, it would be interesting to obtain some broad idea about the nature and functioning of the institutional credit markets in rural West Bengal in recent years. In order to understand the structure and functioning of the institutional credit systems properly, we discuss several issues such as (1)

rural households' participation in the credit markets (both institutional and non-institutional), (2) relative performances of various institutional credit agencies in supplying credit to the rural households in our study areas, (3) access of different categories of households to institutional credit, (4) terms and conditions of institutional loans, (5) cost of borrowing of institutional loans, (6) the issues related to institutional loan default and finally (7) an estimation of the 'credit gap' in the context of institutional loans for various categories of farming households in our study areas.

Database and Methodology

For examining various issues related to institutional credit markets in rural West Bengal, we relied exclusively on primary data. For the collection of primary data, we have purposively chosen two districts of West Bengal, namely Burdwan and Birbhum. While Burdwan is considered as an agriculturally advanced district in West Bengal, Birbhum is however, backward in this respect.² Selection of these two agro-economically contrasting districts would enable us to understand better the functioning of the institutional credit market in West Bengal under diverse agrarian systems.

We have chosen two administrative blocks from each district. The blocks chosen from Burdwan district are Memari-I and Galsi-II while the same for Birbhum district are Nalhati-I and Bolpur-Sriniketan. The blocks were chosen in such a way that they represent the overall characteristics of the respective districts. Four villages have been chosen from these four blocks. While the villages chosen from Memari-I and Galsi-II are Gantar and Hitta respectively, the same from Nalhati-I and Bolpur-Sriniketan are Paikpara and Bergram respectively.

As both socio-economically and agriculturally the villages of Burdwan district are relatively more advanced than those of the Birbhum district, hence, in our subsequent discussion, we refer the villages of Burdwan district as 'advanced villages' while those of Birbhum district as 'backward villages'.³

For the collection of micro-level data, a complete village listing has been prepared for each sampled village and the households were categorized as per their operated land area. The principal categories of households as per their operated areas were (i) agricultural labourers (operating no land), (ii) lower marginal farmers (operating less than 1 acre of land), (iii) upper marginal farmers (operating 1.00 - 2.49 acres of land), (iv) small farmers (operating 2.50 - 4.99 acres of land), (v) medium farmers (operating 5.00 - 7.49 acres of land) and (vi) large farmers (operating 7.50 acres and above). From each village, we took a sample of 100 households covering all the above categories with probability proportional to the size of their respective stratum. Hence, we surveyed a total of 400 households from four sampled villages. The fieldwork has been conducted in two stages. The first round of survey continued between December 2001 to February 2002 covering the Kharif season (July 2001 to December 2001) and the second round ranged

between June-July 2002 covering the Rabi/Boro season (January 2002 to June 2002). Hence, the reference period of this study is the agricultural year July 2001 to June 2002. For the collection of household-level data, we adopted the 'direct-personal-interview method' using a structured questionnaire.

Sample Households' Participation in the Rural Credit Markets

Our analysis of field data reveals that 92 per cent of rural households have borrowed from the institutional and/or non-institutional sources for meeting their credit requirements in our study areas comprising four villages of Burdwan and Birbhum districts during our survey period (2001-02) (Table 1). However, the households' participation in rural credit systems is relatively less in the backward villages (88 per cent) as compared to the advanced villages (96 per cent). This is probably because the households in the advanced villages exercise multiple cropping, which raise their total expenses for cultivation and compel them to borrow more from the credit markets.

Table 1 also gives the percentage distribution of the borrowing households under the two sources of borrowing - institutional and non-institutional. It is clear that the agricultural labourers and the lower marginal farmers have depended very significantly on the non-institutional sources in order to meet their credit requirements in our study areas, especially in the advanced villages. In the advanced villages, about 94 per cent of borrowing households in the category of agricultural labourers and about 98 per cent in the category of lower marginal farmers have taken loans from the non-institutional sources while the corresponding percentages for backward villages are about 85 per cent and about 88 per cent respectively. Among various categories of households, the medium & large farmers⁴ have the highest percentage of households borrowing from the institutional sources in both the advanced and backward villages. In the advanced villages, about 82 per cent of the borrowing households in the category of medium & large farmers have borrowed from the institutional sources. In the backward villages, the corresponding figure for them is about 92 per cent. Furthermore, it is clear that the percentage of households borrowing from the institutional sources increases with the increase in farm size in our surveyed villages. In so far as a large section of the marginal and small farmers remained outside the purview of the institutional credit system, the non-institutional lenders naturally attend more to their credit needs.

As we look into the percentage of loan amount borrowed from two alternative sources, namely institutional and non-institutional, we find that the share of the institutional sources in total loan amount is about 38 per cent in the advanced villages and about 36 per cent in the backward villages. Considering all villages together, the share of institutional loan amount to total credit turns out to be 37.53 per cent (Table 1). This reaffirms the conclusion that the non-institutional lenders supply a significant amount of loan in our surveyed villages⁵.

Sources of Institutional Loan

In our surveyed villages, the sources of institutional credit include the commercial banks, the co-operative credit societies and the regional rural banks (i.e. the *gramin* banks). Let us now examine the performances of various institutional credit agencies in our study areas. Table 2 provides data on this aspect. It is observed that in our surveyed villages, among the three institutions the village level co-operative societies have supplied loans in about 90 per cent cases. The lower categories of households have relatively greater access to loans from this source. The commercial banks are found to have supplied credit only in the advanced villages and they have favoured households belonging to higher categories. The marginal and small farmers have very little access to loans from the commercial banks in the advanced villages. Thus we have clear evidence of commercial banks being reluctant to supply credit in the backward areas and also to the poorer farmers. The performance of the *gramin* banks both in the advanced and backward areas of our study have been also far from satisfactory. It is found that although the *gramin* banks supplied loans only to the 'marginal' and 'small' farmers in the backward villages, they served more to the credit needs of the 'small' and the 'medium & large' farmers in the advanced villages. Clearly, the lending behaviour of the *gramin* banks has not been always consistent with their proclaimed objective of providing loan support to the 'marginal' and 'small' farmers and agricultural labourers.

As regards the percentage share of these three institutions in total amount of institutional loan, it is found that the village level co-operatives alone disbursed nearly 76 per cent of total institutional loan when considered for all villages together (Table 2). For all villages, the corresponding percentages for the commercial banks and the *gramin* banks have been about 18 per cent and about 6 per cent respectively. This, once again, brings out the predominance of the co-operative societies in the villages of West Bengal.

Overall, it is clear from Table 2 that the dependence of poorer households on the co-operative credit system has been much higher as compared to the better-off households. In the advanced villages, the agricultural labour households and marginal farmers have not received any credit from sources other than the co-operatives. It is also clear that there is a monotonically declining relationship between the percentage of institutional credit obtained from the co-operatives and farm size when considered for all villages together. The available evidence clearly shows that the poorer households relied rather heavily on the co-operative credit as compared to credit available from other institutional sources.

Table 2 also presents data on the amount of institutional loan per borrowing household. As expected, the amount of institutional loan per borrowing household goes up with increasing farm size. This is because loan amounts from the institutional sources are determined by the loan requirements of the households, which, in turn, is determined by their respective scales of operation (area operated is an indicator of scale of operation).

An important feature regarding advancement of institutional credit to the landless agricultural labour households is that until recently they had remained outside the purview of any institutional credit (exceptions were government sponsored credit schemes like IRDP etc.). However, thanks to the introduction of the pawning system by the village level co-operatives recently, the landless labourers could avail of loans from these co-operatives by offering some security, particularly utensils. This explains the reason behind the agricultural labour households borrowing from the co-operatives only in the market for institutional credit. The objective of co-operative pawning system has been to protect the poor rural households from the clutches of the village moneylenders who adopt malpractices of various types apart from usurious rates of interest to exploit the poorer households. The loans obtained under the pawning system are used mostly for consumption purposes. The rate of interest charged is quite low at around 8 per cent per annum. As regards amount to be sanctioned under this loan system, it is generally 50 per cent of the market value of the collateral offered. It, however, needs to be admitted that although the objective of this system has been to help the asset-less and asset-poor farmers, its progress has not been widespread as yet in our study areas.

Access to Institutional Loan

The differential rate of participation by the rural households in the institutional credit system in our study areas indicates that there exists a set of factors that help some households to obtain loans in the market for institutional credit. In other words, an important question arises here is that of the determinants of rural households' access to the institutional loans. We attempted to find an answer to this question econometrically. Our approach has been to estimate some Probit regression models that help to identify the factors which cause inter-household variation in access to the institutional loans in our surveyed areas. We quantified the access to institutional loan by constructing a dummy variable, which assumes value 'one' if the household in question has taken an institutional loan during our study period (July 2001 to June 2002) and the value is 'zero' otherwise. On this basis, it is found that out of total 400 households in our sample, the value of the dummy is 'one' for 148 households while it is 'zero' for the rest.

The factors that are considered as the possible determinants of the sample households' access to the institutional loans are the following:

Operated area (OPAR): Access to the institutional loan is supposed to depend on the size of the farm. In order to understand the impact of this factor on the access to institutional loan, we consider area operated by different categories of households as an indicator of their farm size. Since the institutional credit agencies in general follow the asset-based lending policies, we hypothesize that the relationship between access to institutional credit and area operated by the household is positive.

Caste status (CASTE): The institutional credit agencies are often alleged to

suffer from caste bias. Hence, the caste status of the households might turn out to be an important determinant of the availability of institutional loan. It is possible that the households belonging to the lower caste categories are also economically poor and they may have little access to the institutional loan. In order to capture the impact of caste status on the access to institutional loan, we use a dummy variable that assumes value 'one' for the households that belong to scheduled castes/tribes and the value of the dummy is 'zero' otherwise. The hypothesis is that the relationship between the caste status and access to the institutional loan is negative.

Education (EDN): The access to the institutional loan may also depend on the educational level of the households. The households with higher level of education are aware of the facilities extended by the institutional agencies and also the process by which the same can be availed of. Therefore, the probability of getting the institutional loans goes up with the increase in the educational level. In order to understand the impact of education on the access to institutional loan, we consider the number of years of schooling of the heads of the households. We hypothesize that the relation between education and access to institutional loan is a positive one.

Worker-population ratio (WPR): A higher worker-population ratio implies higher number of workers in relation to the total family members of the household. Therefore, the households with higher worker-population ratios are relatively less compelled to borrow in the market for credit. Thus, the worker-population ratio might be considered as another determinant of access to the institutional loan. The relationship between these two is hypothesized as negative.

Paid-out cost (POC): Another possible determinant of access to institutional loan may be the paid-out costs of the farming households. Paid-out costs may be defined as costs owing to material inputs, bullock labour (hired and owned), irrigation, hiring of implements & machinery and hired human labour. It is expected that the households having higher paid-out costs have greater necessity of borrowing. The validity or otherwise of this hypothesis can easily be tested by looking at the relationship between the access to institutional loan and paid-out costs of the farming households.

Farm business income (FBI): Access to institutional loan may be related to the farm business income of the households also. Farm business income (from all crops) is computed by deducting total expenditure on crop production from total value of crop output. It is expected that the households with higher farm business incomes are the well-to-do farmers and, therefore, have better access to institutional loan. We hypothesize that the relation between farm business income and access to institutional loan is positive.

Overdue (OVERDUE): In the institutional credit market, the lenders in general do not issue fresh loans to the persons who are reported to have past overdue of the institutional loan. This implies that overdue in respect of the institutional loan may be a possible detriment towards access to such a loan. The

relationship between overdue and access to institutional loan is hypothesized as negative.

Region (REG): In a region characterized by advanced agricultural conditions (in terms of adoption of irrigation and other complementary inputs), the risk of agriculture is lower (in terms of crop failure etc.). Thus, the institutional credit agencies would prefer to lend more in those areas, which are agriculturally developed since the risk of loan default is likely to be lower. Therefore, it is expected that the supply of institutional loan is higher in the advanced agrarian regions. In order to test the validity of this hypothesis, we consider a region dummy, which assumes value 'one' if the household belongs to an advanced agrarian region, and the value is 'zero' otherwise.

The probit regression results for various categories of households for advanced, backward and all villages combined are presented in Tables 3.1 through 3.3⁶. As regard the households operating less than 2.5 acres of land in the advanced villages (Table 3.1), all of our explanatory variables namely OPAR, CASTE, EDN, WPR, POC, FBI and OVERDUE are statistically significant determinants of access to the institutional loan. All these variables also have signs as per our expectations. In the same villages, for households operating more than 2.5 acres of land, OPAR, POC, FBI and OVERDUE are the variables that have expected signs and statistically significant. When we consider all farmers of the advanced villages, we find that the variables OPAR, CASTE, EDN, WPR, POC, FBI and OVERDUE have expected signs and also are statistically significant in one equation or the other. The regression results for all households (i.e. X all categories of farmers and also agricultural labourers) reveal that all of our explanatory variables are statistically significant as determinants of the households' access to the institutional loan. All these variables have expected signs too.

The probit regression results for the backward villages are presented in Table 3.2. For the households operating less than 2.5 acres of land in the backward villages, as many as six variables namely OPAR, CASTE, EDN, POC, FBI and OVERDUE appear to be statistically significant determinants of access to institutional loan and all these variables have signs as per our hypotheses. For households operating more than 2.5 acres of land in the backward villages, the statistically significant determinants of access to institutional loan are OPAR, POC and FBI. For all farmers, the variables that are found statistically significant are OPAR, CASTE, EDN, POC, FBI and OVERDUE. All these variables have expected signs too. A similar result is obtained when we consider all households of the backward villages.

In Table 3.3, we present the probit regression results for all villages put together (advanced plus backward). It is found that for the households with operated area less than 2.5 acres, OPAR, CASTE, EDN, WPR, POC, FBI and OVERDUE are statistically significant variables in determining their access to the institutional loans. All these variables also have expected signs. For the

category of households operating more than 2.5 acres of land, OPAR, POC, FBI and OVERDUE appear to be the statistically significant determinants of access to institutional loan. For this category of household, the region dummy (REG) has a positive sign and is statistically significant implying that access to institutional loan is higher in the advanced areas as compared to the backward ones. If we consider all farmers, all of our explanatory variables namely OPAR, CASTE, EDN, WPR, POC, FBI and OVERDUE are found statistically significant and they have expected signs. The same variables are found statistically significant with expected signs for all households also. For all farmers as well as for all households, the region dummy is positive and statistically significant.

From the above analysis, it is clear that area operated is a statistically significant variable in determining access to institutional loans by the rural households in our study areas. The institutional lending agencies follow an asset-based lending policy in as much as the households with higher operated area have better access to such loans. Further, households with inferior caste position and lower education are discriminated against in the matter of distribution of the institutional loans in our surveyed villages. Households with higher paid-out costs and/or higher farm business income are wealthy farmers who have better accessibility to the institutional credit. However, as expected, existence of past loans as outstanding reduces the possibility of obtaining the institutional loans. Finally, households residing in the advanced agricultural regions have better access to the institutional loans than those residing in the backward regions. All these findings are very much consistent with the hypotheses formulated above. In sum, in our surveyed villages, the institutional credit agencies followed a policy of favouring the well-to-do farmers and also those having superior castes and educational backgrounds.

Purpose of Institutional Loan

Let us now examine the purposes for which the institutional loans are taken by different categories of households in our study areas. Table 4 provides data for the same. It is observed that the loans taken from the institutional sources are meant for their use mainly for production purposes. In the advanced villages, in about 93 per cent cases, the institutional loans have been used for production purposes. The corresponding percentage in relatively backward villages is found to be nearly 67 per cent. However, the landless labourers borrow from the institutional sources (co-operatives) exclusively for purposes of 'generalized consumption'⁷. The rate of borrowing from the institutional sources (co-operatives) by the poorer households for consumption and health care seems to be relatively higher in the backward villages as compared to the advanced ones.

In the villages surveyed by us, production loans represent loans taken for cultivation of different crops. Crop loans are available seasonally – for production of *kharif* crops and/or *rabi/boro* crops. In the advanced villages, crop loans are availed of relatively more frequently for production of *rabi/boro* crops. This is possibly because cultivation of *rabi/boro* crops involves much

higher cost of cultivation. In the backward villages, the production loans are available for cultivation of *kharif* crops only because of inadequate cultivation of *rabi/boro* crops in those villages. Among *rabi/boro* crops, the cultivating households of the advanced villages mostly borrow for potato cultivation. Considering all villages together, the percentage of loan cases used for different crops reveals that the cultivators mainly borrow for the cultivation of *aman* paddy followed by potato and *boro* paddy.

Collateral for Institutional Loan

It is well known that the institutional loans are collateral based loans. This is true irrespective of the purpose of loan as also the type of borrower. The collateral-based lending policies pursued by the institutional credit agencies arise as hurdle before the landless and asset-poor farmers in obtaining the institutional loans. However, the introduction of pawning system by the village level co-operatives helps in removing this hurdle as, under this system, utensils are accepted as collateral. As a consequence, the landless agricultural labourers can also avail the institutional loan against such a collateral. Table 5 displays the distribution of institutional loan cases according to collateral offered. The table reveals that, in our study villages, the landless labourers offer utensils as collateral security for obtaining institutional loans in all the cases. Otherwise, land is the most important security for institutional loans and other marketable items such as gold, fixed deposits etc. are also accepted as collateral by the institutional agencies.

In our study areas, in about 88 per cent of total institutional loan cases, land is offered as collateral security in the advanced villages. In the backward villages, the corresponding percentage is about 63. Combining all villages together, in about 76 per cent of total institutional loan cases, households offered land as collateral security. For all villages taken together, utensils have been offered as collateral security in about 21 per cent of total institutional loan cases. On the other hand, in about 3 per cent cases only, fixed deposits and gold are being offered as collateral securities for obtaining institutional loan in our study areas. It, therefore, clearly establishes that without offering any collateral, it is impossible to obtain loans from the institutional credit agencies.

Cost of Borrowing of Institutional Loans

The total cost of borrowing of institutional loans can be defined as the sum of interest charges on institutional loans and the transaction costs incurred for getting these loans sanctioned. It is generally argued that the borrowers face several problems such as delay in disbursement of loan, large number of visits to the bank branches and so on for getting loans from the institutional credit agencies (Adams & Nehman, 1979; Sarap, 1991; Chaudhuri, 2004). All these lead to a high transaction cost of borrowing from the institutional credit agencies. The data on the difficulties involved in getting the institutional loans from the institutional credit agencies in our study areas and also the transaction cost and total cost of borrowing of such loans are presented in Table 6. In order to capture

the difficulties faced by the borrowers in getting the institutional loans, we used two indicators namely (a) average days taken for getting the loan amount in hand i.e. the delay in loan disbursement and (b) average number of visit to the bank branch for getting the loan sanctioned.

As regards the days taken for getting the loan sanctioned from the institutional agencies, it clearly emerges that, in the advanced villages, the rural households have to wait 21 days on an average before getting the loan in hand. In the backward villages, this waiting period is much higher (45 days). In both the advanced and backward villages, average number of days taken for getting the loan in hand goes down as we move to the higher farm size categories.

In the backward villages, the poorer households have to pay greater number of visits to the bank branches for getting their loans sanctioned. However, this is not true for the advanced villages. Here the higher categories of farmers have to pay greater number of visits to the bank branches. This is possibly because a good number of households in the higher farm size groups in the advanced villages have been served by the commercial banks, which are reported to have delayed relatively more as compared to other institutional agencies in the matter of disbursement of loans. In order to compute the transaction cost, we first calculated the implicit value of labour hours that are spent during the busy season for getting the loan sanctioned. These hours are usually spent on aspects such as going to the bank branch for submitting the application, making frequent visits to expedite the matter and so on. Labour hours spent on these matters has been imputed by the going market wage rate and termed as 'value of own labour'. Apart from this information, we have obtained data on 'bribes offered' and 'other costs/charges' involved in getting the loans sanctioned by the borrowing households. The 'other costs/charges' include items such as traveling expenses incurred for going to the bank branches, searching cost of land deed etc. All these costs are added with the imputed value of own labour to obtain an estimate of transaction cost associated with the institutional loan.

It is observed that the transaction cost of institutional loan is generally low in all types of villages, especially in the backward ones. In the advanced villages, the transaction cost per 100 rupees of institutional loans is computed to be 87 paise only while the same for the backward villages is only 3 paise (Table 6). For all villages, the transaction cost per 100 rupees of institutional loans has turned out to be only 61 paise. In our surveyed villages, the transaction costs are lower because here significant numbers of crop loans are drawn from the co-operative credit societies, which are locally established and also have members in the managing committees representing all categories of households. This factor benefits the rural households in getting the institutional loan, particularly from the co-operatives, at the expense of very low transaction cost. However, if we compare the transaction costs of institutional loans for various categories of households, we observe that transaction costs are lower for the households belonging to the higher farm size group in the backward villages. However, in the advanced villages of our study areas, this relationship does not follow. Here,

the better-off farmers have incurred higher transaction costs as compared to the poorer households. This is because these categories of farmers are mostly served by the commercial banks whose officials, in some cases, are reported to accept bribes in lieu of sanctioning the loans. These borrowers also have to incur high traveling expenses as they frequently visit the commercial bank branches to expedite the matter. As a consequence, the borrowers relying on the commercial banks for loans have to incur higher transaction cost. On the contrary, in the backward villages of our study, the co-operative societies and the *gramin* banks together serve the households and the farmers need not offer any bribe for obtaining loans from these two sources. Consequently, the transaction cost here is lower and, as expected, it also decreases with the increase in farm size.

Table 6 also provides data on total costs of institutional loan for different categories of households. Total costs are obtained by adding transaction costs with interest charges on the institutional loans. It appears that different categories of households do not differ much in respect of explicit interest charges (i.e. the rate officially charged by the lending agencies) on their borrowing for crop production purposes. However, considering all villages together, it seems that the total cost of borrowing is higher for better-off farmers. This is because of high transaction cost they incur while borrowing from the institutional agencies.

Default of Institutional Loan

In this section, we discuss the issue of default of the institutional loans by various categories of households in our study areas. The data on this aspect are presented in Table 7. The data on default of the institutional loans relate to the survey year chosen for this study (i.e. July 2001 to June 2002). In other words, we report the amount of loan default by the sample households as on 30.06.2002. The institutional loans were taken during one year preceding this date and were supposed to be repaid on or before this date. Table 7 shows that, considering all villages together, of all institutional loan cases disbursed during our survey period, in about 50 per cent cases, the borrowers did not repay their loans in time. Furthermore, the percentage of loan default is higher in the advanced villages (58 per cent) as compared to the backward ones (43 per cent) during our survey period. Among various categories of households, for all villages taken together, the incidence of institutional loan default has been high for the borrowers belonging to lower farm size groups although that did not necessarily mean that only the poorer households defaulted the institutional loans in our study areas. This gets supported from the fact that in about 53 per cent cases the medium & large farmers defaulted the loans taken from the institutional sources during our survey period (considering all villages together).

As regards the distribution of defaulters into various land size groups, it is found that the majority of the defaulters are drawn from the category of small farmers (about 28 per cent), which is followed by the upper marginal farmers (about 26 per cent), medium & large farmers (about 25 per cent), lower marginal

farmers (about 11 per cent) and agricultural labourers (about 11 per cent) in the advanced villages. In the backward villages, the lower marginal farmers come first, followed by the agricultural labourers, upper marginal farmers, medium & large farmers and small farmers (in descending order of percentage share in total defaulters of institutional loans). For all villages taken together, among various categories of households, the percentage of defaulters is the highest for the upper marginal farmers followed by the lower marginal farmers, agricultural labourers, small farmers and medium & large farmers. As regards the percentage share in total defaulted amount, considering all villages together, the same increases steadily with the farm size.

Characteristics of Defaulters of Institutional Loan

In the context of discussion on the default of institutional loan, it would be interesting to find out the characteristics of the defaulters in our study areas. For this analysis, we define defaulters as those who have taken loans from any of the institutional agencies in the year preceding our survey (i.e. between July 2000 to June 2001) but have some amount as outstanding even by the date 30.06.2002. On the other hand, non-defaulters are those who had taken loans during 2000-01 but have no overdue by 30.06.2002. The households who have not participated in the institutional credit market during 2000-01 are excluded from this analysis. In this study, we define default of institutional loan by constructing a dummy variable, which assumes value 'one' if the household has some amount outstanding, as on 30.06.2002 and the value is 'zero' otherwise. On this basis, it is found that out of a total of 202 households, the value of the dummy is 'one' for 92 households while it is 'zero' for the rest.

We consider the following as determinants of loan default:

Operated area (OPAR): Operated area available to a household may be one of the possible determinants of loan default in the context of the institutional loan. It is quite possible that the households with higher operated area have greater capacity to repay the institutional loan, also within the stipulated time. This implies that the possibility of institutional loan default is lower among higher farm size groups. Hence, the relationship between operated area and loan default is likely to be negative.

Education (EDN): The households with higher formal education are aware of the terms and conditions of the institutional loan. Hence, the households with higher formal education are expected to repay their loans in time. Thus, the probability of default of the institutional loan is expected to be low as the educational levels of the households increase. In order to understand the impact of education on loan default, we consider the number of years of schooling of the heads of the households as indicative of their educational levels.

Farm business income (FBI): Farm business income of the households may be another determinant of default of the institutional loan. It is expected that

households with higher farm business incomes are well-to-do farmers. Their possibility of defaulting the loans is, naturally, lower.

Value of non-land income generating assets (NLIGA): Farm households who have some non-land income generating assets such as livestock, goats etc. may get some liquid income almost throughout the year. In any case, possession of these items increases total income of the households. Moreover, in cases of emergency, they may withstand the pressure of liquidity by depleting a part of their assets. Naturally, the possibility of institutional loan default is lower for the households who have higher value of non-land income generating assets.

Proportion of non-institutional loan to total loan (NITL): Proportion of non-institutional loan to total loan may be a possible determinant of loan default in the context of the institutional loan. It has been noted by some scholars that one of the major reasons for defaulting the institutional loan has been the household preferring to repay the non-institutional loans in time as compared to the institutional loan, as the former often involves high rates of interest. Hence, the households who have higher proportion of non-institutional loan amount to total loan have greater probability of defaulting the institutional loan. Our hypothesis is that the relationship between the proportion of non-institutional loan to total loan and default of institutional loan as positive.

Region (REG): The households residing in the agriculturally advanced areas are likely to enjoy better economic conditions than those residing in the backward agrarian regions. Moreover, the risk of agriculture is also lower in the advanced areas as compared to the backward areas. Hence, the possibility of default of the institutional loan is likely to be lower in the advanced agrarian regions. To test the validity of this hypothesis, we have considered a region dummy, which assumes value 'one' if the household is residing in the advanced agrarian region and the value is 'zero' otherwise.

In order to explain the characteristics of defaulters of the institutional loans in our study areas in terms of the above factors, we have run some probit regressions the results of which are presented in Table 7.1. For the households operating less than 2.5 acres of land, the variables such as OPAR, EDN, FBI and NLIGA are found to be statistically significant determinants of default of the institutional loans. All these variables have signs as per our expectations. The region dummy (REG) for this category of household is negative and also statistically significant implying that default of institutional loan is higher in the backward areas as compared to the advanced areas. For the households operating more than 2.5 acres of land, OPAR, EDN, FBI and NITL are the variables that have expected signs and also are statistically significant. For this category of households also, the region dummy is statistically significant with expected sign. When we consider all farmers' sample, the variables such as OPAR, EDN, FBI and NLIGA are found to have expected signs and also are statistically significant. The regression results for all households (i.e. all categories of farmers plus agricultural labourers) reveal that OPAR, EDN, FBI and NLIGA are the variables

that are statistically significant determinants of default of institutional loans. All these variables also have signs as per our expectations. The coefficient of the region dummy is also negative and statistically significant.

Overall, it appears that the households having higher operated area, higher education, higher farm business income and higher non-land income generating asset have lower probability of defaulting the institutional loans. However, the hypothesis that the households having higher proportion of non-institutional loan to total loan appear more as defaulters gets rejected in the context of our study areas (except for the sample representing households operating more than 2.50 acres of land). Of course, the probability of defaulting the institutional loan is higher in areas that are agriculturally backward.

The Credit Gap

In this section, our objective is to estimate the 'credit gap' for the institutional loans in our study areas. Here 'credit gap' is viewed as the proportion of shortfall in credit actually obtained from the institutional sources to credit required by the farming households. In order to measure the credit requirements of the households, we use the estimates given by the 'scale of finance' for different crops. The 'scale of finance' gives an average assessment of credit requirements for cultivation of various crops, as prepared by the Central Co-operative Banks in each district. The 'scale of finance' stipulates the amount of loan any prospective borrower can avail of from any institutional agencies per cultivated acre of any crop. Hence, the difference between the amount of loan that any particular household is eligible to receive (as per 'scale of finance') and the amount actually disbursed to him can serve as a measure of 'credit gap'. The 'credit gap' of the institutional loan on this basis for different crops in our study areas is presented in Tables 8A and 8B.

As regards *aman* paddy, it is found that about 54 per cent of total credit requirements of the households remained unfulfilled when considered for all villages together (Table 8A). This gap seems to be higher in the advanced villages (about 56 per cent) as compared to the backward villages (about 50 per cent). Further, the 'credit gap' as per 'scale of finance' concept increases with farm size. This is true for both the advanced and backward villages. However, it is to be noted that the institutional credit supplied to the lower marginal farmers for cultivation of *aman* paddy remains higher than their requirements, as reflected by the 'scale of finance'. The large 'credit gap' in the context of the institutional loans, more so for higher farm size categories, clearly implies that the banks are rather conservative in sanctioning loans involving large quantities for crop production purposes.

Table 8B shows the 'credit gap' that existed in the context of *rabi/boro* crops in the advanced villages of our study⁸. It is to be noted that the 'credit gap' for *rabi/boro* crops is higher than the same for *kharif* crops. This is because although the 'scale of finance' is higher in the case of *rabi/boro*

crops as compared to *kharif* crops, the flow of credit in the case of the former has been relatively low. While about 56 per cent of total credit requirements of the farming households for cultivation of *aman* paddy remained unfulfilled in the advanced villages, the same for cultivation of potatoes turns out to be about 61 per cent. This large 'credit gap' compels the cultivating households to enter into the non-institutional credit market to fulfil their total credit requirements.

We also computed the 'credit gap' for the institutional credit by employing other concepts that are based on the total costs of cultivation for different crops in our study areas. In order to compute the costs of cultivation for different crops, we used two concepts, namely 'HYV input cost concept' and 'paid-out cost concept'. The 'HYV input costs' include only the costs of material inputs and irrigation while the concept of 'paid-out costs' include costs owing to material inputs, bullock labour (owned and hired), irrigation, hiring of implements & machinery and hired human labour. We consider per acre amount of institutional credit required by different categories of farmers on the basis of 'HYV input cost' and 'paid-out cost' concepts. Using the difference between the same and the institutional credit actually obtained per acre, we get to know the shortfall in credit availability for different categories of farmers. This shortfall in credit availability in relation to credit required provides the measure of 'credit gap' for the institutional loans for our sample households.

Our results relating to the 'credit gap' for different categories of households under 'HYV input cost' and 'paid-out cost' concepts are presented in Table 9. It is observed that when we compute credit requirements of different categories of households on the basis of 'HYV input cost concept', the 'credit gap' appears smaller as compared to the case when we compute the same on the basis of the concept of 'paid-out cost'. In all villages combined, about 26 per cent of total credit requirements remain unfulfilled as per 'HYV input cost concept'. However, when we consider all paid-out costs for cultivating various crops, the 'credit gap' turns out to be as high as 72.08 per cent when considered for all villages together. Moreover, the 'credit gap' is higher in the advanced villages as compared to the backward villages. As per 'HYV input cost concept', considering all households together, while around 36 per cent of total credit requirement remains unfulfilled in the advanced villages, the same in the backward villages is only around 11 per cent. However, as per 'paid-out cost concept', while 72.57 per cent of total credit requirements remain unfulfilled in the advanced villages, considering all households together, the same is 71.63 per cent in the backward villages. Among different categories of farmers, the 'credit gap' is higher among higher farm size categories. This is true for both the advanced and backward villages. Considering all villages together, the 'credit gap' seems to be the highest for the medium & large farmers and this is true under both the concepts. This clearly indicates that though the medium & large farmers incur high cost of

cultivation, they do not get sufficient loans from the institutional agencies. The broad conclusion that emerges from this discussion is that the distribution of institutional credit among different categories of farmers has not been consistent with their requirements of credit, which, in turn, compel the cultivating households of our study areas to borrow from the non-institutional sources.

Summing Up

In our study areas comprising four villages of Burdwan and Birbhum districts in West Bengal, a vast majority of households (about 92 per cent) participate in the rural credit markets for fulfilling their credit requirements. There is thus acute need for credit among the rural households. However, majority of the households of our surveyed villages do not have access to the institutional credit markets. As regards the determinants of rural households' access to the institutional loans, we found that those with higher operated areas, higher caste status and higher educational levels have better access to the institutional loans. Moreover, the households incurring higher costs of cultivation (paid-out costs) and reporting higher farm business incomes obtained more loans from the institutional sources. Of course, the existence of past loan overdue reduces the probability of getting a further loan from the institutional sources. In general, the institutional credit agencies are more inclined to lend in the advanced agricultural regions as compared to the backward ones. In brief, the institutional credit agencies of our study areas follow a discriminatory credit policy, favouring more the wealthy farmers of the advanced agrarian regions as well as the households belonging to superior socio-economic categories.

In our study areas, the commercial banks, the *gramin* banks and the co-operative credit societies are the major suppliers of the institutional credit. Among these three sources, the village level co-operative societies have supplied loans in majority of the cases both in the advanced and backward villages. They also served all categories of households. However, the lower categories of farmers have relatively greater access to loans from this source. While the commercial banks operated in a limited way in the advanced villages surveyed by us, their presence has been almost zero in the backward villages. Moreover, in the advanced villages, they provided loans mainly to the farmers belonging to higher farm size groups. Clearly, the commercial banks in our surveyed villages suffer from both region and class bias. The *gramin* banks also made a limited contribution in our surveyed villages in as much as only in about 4 per cent of all institutional loan cases they supplied loans. Moreover, in the advanced villages, they lent more to the higher categories of farmers. This is inconsistent with their proclaimed objective of lending exclusively to the marginal and small farmers.

Loans provided by the institutional agencies in the advanced villages are both for cultivation of *kharif* as well as *rabi/boro* crops. However, in the backward villages, the institutional agencies lent only during the *kharif* season for the

cultivation of aman paddy. As is well known, primarily the non-institutional lenders meet the consumption credit needs of the rural households by adopting various malpractices. To protect the farmers from these exploitative non-institutional lenders, recently the 'pawning system' has been introduced by the co-operative societies. Under this system, consumption loans are provided against utensils as collateral security. It, however, needs to be admitted that although the objective of this system has been to help the asset-less and asset-poor farmers, its progress has not been widespread as yet in our study areas.

In the context of discussion on the institutional credit, it is often argued that the borrowers are put into many difficulties such as delays in disbursement of loans, large number of visits to the bank branches in getting such loans sanctioned and so on which lead to high transaction cost of the institutional loan. In our study areas, we found that though on an average the borrowers are required to wait thirty days for getting loans in hand from the institutional sources, the transaction cost of the institutional loan, however, is very low. In the advanced villages, it is 87 paise only per 100 rupees of borrowing and the same in the backward villages is only 3 paise. This is because most of the institutional loans are supplied by the co-operative societies, which operate purely at the local level thereby maintaining a greater degree of transparency. However, it is to be noted that in the advanced villages, the transaction cost for the better-off farmers are relatively higher than that of the poorer farmers. This is possibly because these higher categories of farmers are served more by the commercial banks and the transaction costs for the loans obtained from them are generally higher than those obtained from the village level co-operative societies and locally established *gramin* banks.

The issue of institutional loan default assumes special significance in the context of discussion on the institutional credit. Considering all our study villages together, in about 50 per cent of total loan cases, the institutional borrowers did not repay their loans in time, which is indicative of high rate of loan default. As regards the incidence of loan default among various farm size groups, it is found that all categories of households displayed a high incidence of defaulting the institutional loans although such a tendency is more revealing in the case of poorer households. In any case, our data do not support the view that only the poorer households default the institutional loans.

Given the preponderance of marginal and small holdings in our sample, the probability of loan default appears to be relatively high among them when looked through the lens of the probit regression model. We have also found that the educated households and those reporting higher farm business income and higher value of non-land income generating assets have lower probability of defaulting the institutional loans in our study areas. Moreover, the probability of defaulting the same is less in the advanced villages as compared to the backward ones.

In order to understand the performances of institutional credit agencies in

supplying credit to our surveyed villages, we have estimated the 'credit gap' of the institutional loans for different categories of households. We defined 'credit gap' as the proportion of shortfall in credit availability to credit required by the farming households. We measured this on the basis of 'HYV input cost' concept, 'paid-out cost' concept and also as per the concept of 'scale of finance' for different crops. In all cases, it has been observed that the institutional credit agencies are far behind in meeting the total credit requirements of the farming households. Combining all villages together, about 26 per cent and about 71 per cent of total credit requirements remain unfulfilled as per the 'HYV input cost' and 'paid-out cost' concepts respectively. As per the concept of 'scale of finance', the 'credit gap' of the institutional loans is estimated to be 54 per cent in the case of *aman* paddy, 56 per cent for *boro* paddy and 61 per cent for potato cultivation. This inadequacy of the institutional credit encourages the farming households of our study areas to enter into the non-institutional credit markets to fulfil their total credit requirements.

Policy Implications

In the light of the above findings, the following policy suggestions may be put forward:

(1) Our analysis of primary data has clearly shown that the institutional agencies have been meeting only 37 per cent of the total credit requirements of the rural households thereby allowing the non-institutional lenders to operate rather freely and exploiting the rural borrowers. As mentioned earlier, various other studies based on some other districts of West Bengal have also found that the institutional credit agencies are unable to meet the entire credit demand of the farming households and as such, they are bound to depend on the exploitative non-institutional sources (Bhattacharyya, 1997; Samal, 2002; Bhaumik & Rahim, 2004; Rawal, 2005). The picture that we obtain is that of inadequate supply of institutional credit, which might sooner or later act as a drag on development of agriculture in the state. The prevailing situation sought for an urgent need of expansion of the base of institutional credit for further agricultural development of West Bengal.

(2) The existence of a large 'credit gap' in institutional loan in our surveyed villages is perhaps the resultant of supplying credit by the institutional agencies following the norm set by the 'scale of finance'. The 'scale of finance' is generally fixed on the basis of credit requirements of a 'typical (average) farmer', which is neither suitable for the poor farmers nor for those aspiring to make additional (more than average) spending on modern inputs. Hence, our suggestion is that the credit limit (i.e. the 'scale of finance') be fixed more flexibly so that it fits in the requirements of all types of farmers (having differing entrepreneurial skill) even within a given size class. In any case, the 'scale of finance' should be wider than that currently prevails so as to entertain loans involving higher amounts.

(3) It goes without saying that for any credit policy to become successful,

prompt and full recovery of loaned funds becomes an absolute necessity. However, our household-level data revealed a very high rate of default of the institutional loan in our study areas. Such a high rate of default is perhaps inescapable when the rural borrowers have to depend so heavily on the non-institutional credit markets because of non-availability / inadequate availability of institutional credit. In fact, a very high percentage of our sampled households have borrowed simultaneously from the institutional and non-institutional sources. As the non-institutional loans generally carry high rates of interest vis-à-vis the institutional loans, the borrowers are very likely to attach seniority to the former at the time of repaying. This might raise the incidence of default of the institutional loans, particularly by the poorer households. Nevertheless, there should be some efforts to reduce the extent of loan default without which the very existence of the institutional credit agencies gets eroded. Perhaps devising some legal provisions and enforcing them seriously might be helpful in this context. A lesson could be drawn from Punjab and Haryana where the system of initiating legal proceedings against the wilful defaulters helps to improve the loan recovery performance by the lending agencies. Further, there should be a sustained campaign in rural areas for timely recovery of loans obtained from the institutional agencies. The *panchayats* in West Bengal could play an important role in this regard.

(4) It is also to be appreciated that sometimes the poor borrowers are forced to default their loans because of events that are beyond their control. For example, in course of our field survey, it was revealed by many farmers that they defaulted the institutional loans (during our survey year specifically) mainly due to very low post-harvest prices of their products. The prices fetched by their crops could barely cover the production expenses incurred by them. A situation such as this calls for extending the farmers the insurance cover not only against the crop-failure due to natural calamities but also in the event of adversities in the market that result in sudden fall in crop-prices. Devising an appropriate 'rescheduling' of loans could also mitigate the difficulties such as this by the borrowers.

(5) Overall, our field survey revealed that the village level co-operatives are currently catering to the credit needs of rural people in West Bengal in a substantial manner as compared to other agencies such as the commercial banks and *gramin* banks. They have been also following a policy of preferring the categories of marginal farmers⁹ and agricultural labourers. The importance of co-operative credit in rural West Bengal has also been emphasized by Rajeev & Deb (1998), Samal (2002), Rawal (2005). The study results of Rajeev & Deb showed that 85 per cent of their surveyed households were covered by the credit facilities of the co-operatives while only 27 per cent of the households took loan from the commercial banks. Based on secondary data, Samal found that even though the share of co-operatives (in disbursement of total short term loan) had decreased from 61 per cent in 1987-88 to 59 per cent in 1998-99, still they had the major share in short term credit supply in West Bengal. Rawal examined the functioning of a co-operative credit society in his study area for the years 1974-75 to 2002-

05. He concluded that 'there is good potential for expanding the role of cooperatives in rural credit markets in West Bengal'. As the cooperatives can mobilize substantial amount of local liquidity and expand the disbursement of credit on that basis, this can mitigate the impact of decline in credit provision by the commercial banking system. It is therefore clear that the future agricultural development in West Bengal is very likely to be influenced by the performances of the co-operatives. Hence, strengthening of the co-operative credit system in rural West Bengal should be the top most priority of the policy makers.

Notes

1. For details see Chatterjee (2004), Rawal (2005).
2. On the basis of the following indicators, we termed Burdwan as 'advanced district' and Birbhum as 'backward district'.
3. Based on the following indicators, the villages of Burdwan district are termed as 'advanced villages' while the same of Birbhum district as 'backward villages'.
4. The medium and large farmers have been considered together because of the inadequacy of sample size, particularly for the latter.
5. For similar conclusions see Bhattacharyya (1996), Bhaumik and Rahim (2004), Rawal (2005).
6. It is important to note that many of our explanatory variables have displayed strong correlations among themselves. In order to avoid the problem of multicollinearity, we have run several regressions for each category of households by dropping some of the variables, which appeared to be multicollinear.
7. By 'generalized consumption' we mean consumption and health care, social purposes etc.
8. This discussion is confined to the advanced villages only as no institutional credit has been provided for cultivation of *rabi/boro* crops in the backward villages.
9. The majority of the agriculturists in West Bengal belong to the 'marginal' category.

References

- Adams, D. W. and G. I. Nehman, (1979), "Borrowing costs and the demand for rural credit", *The Journal of Development Studies*, Vol. 15, No. 2.
- Bhattacharya, S. (1996), "Evolution of the agricultural credit markets in West Bengal since 1977" in Raychaudhuri and Sarkar (eds.) "Economy of West Bengal: problems and prospects", K. P. Bagchi & Co., Calcutta.
- Bhaumik, S. K. and A. Rahim (2004), "Structure and operation of rural credit markets: some

- results based on field surveys in West Bengal". *Journal of Rural Development*, Vol.23, No.1.
- Chatterjee, S. (2004), Institutional credit and agricultural development in West Bengal, Ph. D. thesis (unpublished), University of Calcutta.
- Chaudhuri, S. (2004), "*Some aspects of agricultural credit in a developing economy*", Serials Publications, New Delhi.
- Ghate, P. et al. (1992), *Informal finance: some findings from Asia*, Oxford University Press, Delhi.
- Jodhka, S. S. (1995), "Who borrows? Who lends? Changing structure of informal credit in rural Haryana", *Economic and Political Weekly*, Vol. 30, No. 39.
- Rajeev, M. and S. Deb (1998), "Institutional and non-institutional credit in agriculture: case study of Hugli district of West Bengal", *Economic and Political Weekly*, Vol. 33, Nos. 47 & 48.
- Ramachandran, V.K. and M. Swaminathan (2002), "Rural banking and landless labour households: institutional reform and rural credit markets in India", *Journal of Agrarian Change*, Vol. 2, No. 4.
- Rawal, V. (2005), 'Banking and credit relations in rural West Bengal' in Ramachandran and Swaminathan (eds.) *Financial liberalization and rural credit in India*, Tulika Books, New Delhi.
- Samal, B (2002), "Institutional credit flow to West Bengal agriculture: revisited", *Indian Journal of Agricultural Economics*, Vol. 57, No. 3.
- Sarap, K. (1991), *Interlinked agrarian markets in rural India*, Sage Publications, New Delhi.
- Swaminathan, M. (1993), "Effects of modernisation on rural credit markets: a case study from Tamil Nadu", *Indian Journal of Agricultural Economics*, Vol.48, No.1.

Indicators	Burdawn	Birbhum	West Bengal
1	2	3	4
Fertilizer consumption per hectare of gross cropped area (kgs.) in 2000-01	149.73	140.85	119.02
Per thousand hectare of net cropped area number of (as in 1997)			
Pumpsets	139.19	102.09	102.34
Power tillers	2.65	0.63	2.52
Tractors	10.80	2.63	3.09
Cropping intensity (1999 – 2001)	1.82	1.48	1.71
Rice yield (kg. per hectare) (1999 – 2001)	2830	2708	2260
Potatoes yield (kg. per hectare) (1999 – 2001)	25611	21346	23439
Source : Statistical Abstract, 2001-02, Government of West Bengal.			

Indicators	Advanced villages	Backward villages
1	2	3
Worker population ratio	55.59	51.02
Lower caste and tribes (%)	47.50	60.00
Average operated area (in acre)		
Kharif	2.31	2.31
Rabi / Boro	2.35	0.94
Percentage of leased - in area to operated area		
Kharif	16.56	19.52
Rabi / Boro	32.82	8.96
Gross cropped area (in acre)	689.6	465.74
Cropping intensity	1.82	1.25
Percentage of modern implements* in total farm assets	72.55	23.52

* includes tractor, power tiller etc.

Source : Field Survey

Table 1 : Participation in Credit Markets by the Rural Households

Category of households 1	Number of households 2	Percentage of households			Percentage of borrowing households under			% of loan amount borrowed from	
		Borrowing	Not borrowing	4	Institutional only	Non-institutional only	Both	Institutional	Non-institutional
		3			5	6	7	8	9
ADVANCED VILLAGES									
Agricultural labourers	36	100.00	0.00		5.56	80.56	13.89	2.87	97.13
Lower marginal farmers	59	91.53	8.47		1.85	83.33	14.81	22.23	77.77
Upper marginal farmers	51	96.08	3.92		8.16	34.69	57.14	26.37	73.63
Small farmers	32	96.88	3.13		3.23	29.03	67.74	43.46	56.54
Medium & large farmers	22	100.00	0.00		18.18	18.18	63.64	48.19	51.81
All farmers	200	96.00	4.00		6.25	54.17	39.58	38.05	61.95
BACKWARD VILLAGES									
Agricultural labourers	37	91.89	8.11		14.71	50.00	35.29	17.21	82.79
Lower marginal farmers	62	91.94	8.06		12.28	56.14	31.58	17.85	82.15
Upper marginal farmers	50	88.00	12.00		18.18	45.45	36.36	43.87	56.13
Small farmers	35	80.00	20.00		28.57	21.43	50.00	49.67	50.33
Medium & large farmers	16	75.00	25.00		33.33	8.33	58.33	33.67	66.33
All farmers	200	87.50	12.50		18.29	43.43	38.29	36.40	63.60
ALL VILLAGES									
Agricultural labourers	73	95.89	4.11		10.00	65.71	24.29	8.98	91.02
Lower marginal farmers	121	91.74	8.26		7.21	69.37	23.42	19.71	80.29
Upper marginal farmers	101	92.08	7.92		12.90	39.78	47.31	31.21	68.79
Small farmers	67	88.06	11.94		15.25	25.42	59.32	45.27	54.73
Medium & large farmers	38	89.47	10.53		23.53	14.71	61.76	44.11	55.89
All farmers	400	91.75	8.25		11.99	49.05	38.96	37.53	62.47

Source : Field survey

Table 2 : Performance of Institutional Credit Agencies in the Surveyed Villages

Category of households	Number of households		Number of loan cases	Percentage of loan cases served by			Percentage share in total loan amount by			Total amount of loan per loanee household (in Rs.)
				Commercial banks	Regional rural banks	Co-operative banks	Commercial banks	Regional rural banks	Co-operative banks	
1	2	3	4	5	6	7	8	9	10	
ADVANCED VILLAGES										
Agricultural labourers	36	7	0.00	0.00	100.00	0.00	0.00	100.00	286	
Lower marginal farmers	59	12	0.00	0.00	100.00	0.00	0.00	100.00	3744	
Upper marginal farmers	51	37	8.11	0.00	91.89	20.44	0.00	79.56	5197	
Small farmers	32	31	9.68	3.23	87.10	14.63	2.44	82.93	11389	
Medium & large farmers	22	25	24.00	4.00	72.00	39.84	2.26	57.91	23476	
All farmers	200	112	10.71	1.79	87.50	26.19	1.82	71.99	9634	
BACKWARD VILLAGES										
Agricultural labourers	37	17	0.00	0.00	100.00	0.00	0.00	100.00	525	
Lower marginal farmers	62	30	0.00	6.67	93.33	0.00	5.75	94.25	1217	
Upper marginal farmers	50	28	0.00	10.71	89.29	0.00	25.56	74.44	3772	
Small farmers	35	22	0.00	9.09	90.91	0.00	22.77	77.23	6586	
Medium & large farmers	16	11	0.00	0.00	100.00	0.00	0.00	100.00	9909	
All farmers	200	108	0.00	6.48	93.52	0.00	15.34	84.66	3749	
ALL VILLAGES										
Agricultural labourers	73	24	0.00	0.00	100.00	0.00	0.00	100.00	455	
Lower marginal farmers	121	42	0.00	4.76	95.24	0.00	2.99	97.01	1671	
Upper marginal farmers	101	65	4.62	4.62	90.77	12.50	9.93	77.57	4183	
Small farmers	67	53	5.66	5.66	88.68	9.95	8.95	81.10	8536	
Medium & large farmers	38	36	16.67	2.78	80.56	31.29	1.77	66.94	14114	
All farmers	400	220	5.45	4.09	90.45	18.12	5.98	75.90	5971	

Source : Field survey

Table 3.1: Probit Regression Analysis of Determinants of Access to Institutional Credit in Advanced Villages

Explanatory variables	Estimated Coefficients															
	Household operating less than 2.5 acres								Household operating more than 2.5 acres							
	Eqn. 1 2	Eqn. 2 3	Eqn. 3 4	Eqn. 1 5	Eqn. 2 6	Eqn. 3 7	Eqn. 4 8	Eqn. 1 9	Eqn. 2 10	Eqn. 3 11	Eqn. 4 12	Eqn. 1 13	Eqn. 2 14	Eqn. 3 15	Eqn. 4 16	Eqn. 4 17
Operated area [OPAR] (in acres)	-	-	1.23* (2.96)	-	-	0.30*** (1.36)	-	-	-	0.42** (1.98)	-	-	-	-	-	0.48* (3.26)
Caste [CASTE] (lower caste & tribes = 1 others = 0)	-	-	1.66* (-2.44)	-	-	-	-	-	-	-	-	-	-	-	-	-
Education [EDN] (No. of years of schooling)	-	-	0.12** (1.80)	0.17 (0.23)	0.31 (0.45)	-	-	0.60 (1.18)	0.64 (1.24)	-	-	0.67*** (1.36)	0.18* (4.35)	0.65*** (1.29)	-	-
Worker Population Ratio [WPR]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Paid out costs [POC] (in Rs.)	-	-	0.42** (1.72)	-	0.22** (1.89)	-	-	-	-	0.23 (0.15)	-	-	0.43* (4.04)	-	-	-
Farm business Income [FBI] (in Rs.)	0.25*** (1.39)	-	-	0.23*** (1.48)	-	-	-	-	0.25** (2.03)	-	-	0.29** (2.33)	-	-	-	-
Overdue [OVERDUE] (in Rs.)	-	-	2.12** (-1.98)	-	2.50** (-2.21)	-	-	-	-	-	-	-	-	-	-	-
Intercept	0.41	-0.77	-1.52	0.39	-0.36	0.32	-1.14	1.27	0.18	-0.22	0.12	-1.85	1.20	0.94	0.84	0.84
Count R ²	0.67	0.84	0.79	0.74	0.74	0.85	0.81	0.80	0.80	0.80	0.81	0.82	0.84	0.84	0.84	0.84
Chi-square (X ²)	15.69*	49.34*	55.79*	3.26	4.75***	18.91*	73.12*	74.91*	77.60*	85.44*	100.72*	101.91*	107.75*	120.92*	120.92*	120.92*
Degree of freedom	3	4	4	3	2	3	4	4	4	4	4	5	4	4	4	4
Number of observations	110	110	110	54	54	54	164	164	164	164	164	200	200	200	200	200

Notes : *, **, *** indicate significance at 1, 5, 10 per cent levels respectively
Figures in the parentheses represent asymptotic t-ratios.

Table 3.2 : Probit Regression Analysis of Determinants of Access to Institutional Credit in Backward Villages

Explanatory variables	Estimated Coefficients														
	Household operating less than 2.5 acres								Household operating more than 2.5 acres						
	Eqn. 1		Eqn. 2		Eqn. 3		Eqn. 4		Eqn. 1		Eqn. 2		Eqn. 3		Eqn. 4
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Operated area [OPAR] (in acres)	-	-	0.58*** (1.61)	-	0.73** (1.95)	0.75** (1.98)	0.22* (2.68)	-	-	-	-	-	0.13*** (1.53)	-	-
Caste [CASTE] (lower caste & tribes = 1 others = 0)	-	-	-1.01** (-1.94)	-0.84** (-1.62)	-	0.26 (0.16)	-	-1.17* (-2.82)	-	-	-	-	-1.61* (-3.86)	-	-
Education [EDN] (No. of years of schooling)	-	0.10** (2.05)	-	-	0.79 (0.78)	0.84 (0.83)	-	-	0.74** (1.93)	-	0.82** (1.86)	-	-	0.10* (2.85)	-
Worker Population Ratio [WPR]	-0.38 (-0.39)	-	-	-	-	0.70 (0.44)	-0.38 (-0.50)	-	-	-0.21 (-0.27)	-	-	-	-	-
Paid out costs [POC] (in Rs.)	-	-	-	0.13* (2.36)	0.11** (1.90)	0.11* (1.88)	-	0.27** (1.89)	-	-	0.44* (2.65)	-	-	-	-
Farm business income [FBI] (in Rs.)	0.96** (2.29)	0.95** (2.22)	-	-	0.48*** (1.62)	0.46*** (1.47)	-	-	0.48* (2.82)	0.81* (4.38)	-	-	-	0.61* (3.36)	-
Overdue [OVERDUE] (in Rs.)	-1.69* (-2.53)	-1.75* (-2.59)	-1.67* (-2.43)	-1.93* (-2.63)	-0.79 (-0.31)	-0.88 (-0.35)	-1.40* (-2.42)	-	-1.35** (-2.33)	-1.29** (2.29)	-1.31* (-2.32)	-1.24** (2.11)	-1.26** (-2.21)	-	-
Intercept	-0.88	-1.56	-0.55	-0.73	0.69	0.43	-0.46	-0.21	-1.16	-1.17	-1.42	-0.24	-1.70	0.74	-
Count R ²	0.71	0.72	0.71	0.71	0.60	0.60	0.67	0.66	0.69	0.71	0.72	0.75	0.74	-	-
Chi-square (X ²)	13.85*	18.09*	21.34*	24.68*	7.79	8.08	21.96*	27.59*	31.67*	44.79*	45.39*	51.97*	53.09*	-	-
Degree of freedom	3	3	3	3	5	7	3	2	3	3	3	3	3	3	3
Number of observations	112	112	112	112	51	51	163	163	163	200	200	200	200	200	200

Notes : *, **, *** indicate significance at 1, 5, 10 per cent levels respectively
Figures in the parentheses represent asymptotic t- ratios.

Table 3.3 : Probit Regression Analysis of Determinants of Access to Institutional Credit in All Villages

Explanatory variables	Estimated Coefficients													
	Household operating less than 2.5 acres						Household operating more than 2.5 acres						All Farmers	
	Eqn. 1 2	Eqn. 2 3	Eqn. 3 4	Eqn. 4 5	Eqn. 6	Eqn. 7	Eqn. 1 8	Eqn. 2 9	Eqn. 3 10	Eqn. 1 11	Eqn. 2 12	Eqn. 3 13	Eqn. 1 14	Eqn. 2 15
1														
Operated area [OPAR] (in acres)	-	-	-	0.86* (3.42)	0.21*** (1.31)	-	-	-	0.32* (4.34)	-	-	0.43* (4.85)	-	-
Caste [CASTE] (lower caste & tribes = 1 others = 0)	-	-	-	1.58* (-4.44)	1.39* (-3.82)	-	-	-	-	-	-	-	-	-
Education [EDN] (No. of years of schooling)	-	0.16* (4.49)	-	-	-	0.28 (0.05)	-	0.14* (5.27)	0.93* (3.21)	-	0.19* (7.41)	-	0.36 (1.03)	-
Worker Population Ratio [WPR]	-	-	-	-	0.27 (0.26)	-	-	-	-	-	-	-	-	-
Paid out costs [POC] (in Rs.)	-	-	0.54* (2.70)	-	-	-	0.19** (2.18)	-	-	0.18** (1.96)	-	-	0.17** (1.85)	-
Farm business income [FBI] (in Rs.)	-	0.40* (2.45)	-	-	-	0.21** (1.75)	-	-	-	0.18*** (1.56)	-	0.21** (1.78)	0.26** (2.17)	-
Overdue [OVERDUE] (in Rs.)	-	0.26** (-1.96)	-	0.28** (-1.98)	-	0.13*** (-1.54)	-	-	-	-	-	-	-	-
Region [REG] (advanced=1, backward=0)	0.17 (0.55)	-	-	-	0.59*** (1.33)	0.54 (1.21)	-	0.37*** (1.53)	0.33*** (1.31)	-	0.32*** (1.35)	-	-	-
Intercept	-	0.34	-	1.68	-	0.21	0.98	-	-	-	-	-	-	-
Count R ²	0.69	0.71	0.78	0.75	0.69	0.69	0.69	0.67	0.71	0.73	0.71	0.74	0.77	0.77
Chi-square (X ²)	18.61*	40.49*	58.15*	62.03*	5.42	7.78***	8.12**	54.19*	74.09*	98.24*	92.33*	111.31*	156.85*	156.85*
Degree of freedom	3	3	3	3	4	5	2	4	4	4	4	5	5	5
Number of observations	222	222	222	222	105	105	105	327	327	327	400	400	400	400

Notes : *, **, *** indicate significance at 1, 5, 10 per cent levels respectively
 Figures in the parentheses represent asymptotic t-ratios.

Table 4 : Purpose-wise Distribution of Institutional Loan Cases in the Surveyed Villages

Category of households	Number of loan cases	Percentage of loan cases used for						Other* purposes
		Aman cultivation	Boro cultivation	Potato cultivation	Cultivation of other crops	Consumption & health care	7	
1	2	3	4	5	6	7	8	
ADVANCED VILLAGES								
Agricultural labourers	7	0.00	0.00	0.00	0.00	100.00	0.00	
Lower marginal farmers	12	41.67	0.00	50.00	0.00	8.33	0.00	
Upper marginal farmers	37	56.76	8.11	35.14	0.00	0.00	0.00	
Small farmers	31	48.39	19.35	32.26	0.00	0.00	0.00	
Medium & large farmers	25	40.00	20.00	40.00	0.00	0.00	0.00	
All farmers	112	45.54	12.50	34.82	0.00	7.14	0.00	
BACKWARD VILLAGES								
Agricultural labourers	17	0.00	0.00	0.00	0.00	88.24	11.76	
Lower marginal farmers	30	46.67	0.00	0.00	6.67	36.67	10.00	
Upper marginal farmers	28	78.57	0.00	0.00	3.57	17.86	0.00	
Small farmers	22	100.00	0.00	0.00	0.00	0.00	0.00	
Medium & large farmers	11	100.00	0.00	0.00	0.00	0.00	0.00	
All farmers	108	63.89	0.00	0.00	2.78	28.70	4.63	
ALL VILLAGES								
Agricultural labourers	24	0.00	0.00	0.00	0.00	91.67	8.33	
Lower marginal farmers	42	45.24	0.00	14.29	4.76	28.57	7.14	
Upper marginal farmers	65	66.15	4.62	20.00	1.54	7.69	0.00	
Small farmers	53	69.81	11.32	18.87	0.00	0.00	0.00	
Medium & large farmers	36	58.33	13.89	27.78	0.00	0.00	0.00	
All farmers	220	54.55	6.36	17.73	1.36	17.73	2.27	

Note : * Other purposes include repayment of non-institutional loan, repayment of overdue of institutional loan etc.

Source: Field survey

Table 5 : Collateral for Institutional Loan in Surveyed Villages

Category of households	Number of loan cases	Percentage of cases with collateral as				Total
		Land	Utensils	Fixed deposits	Gold	
1	2	3	4	5	6	7
ADVANCED VILLAGES						
Agricultural labourers	7	0.00	100.00	0.00	0.00	100.00
Lower marginal farmers	12	83.33	8.33	8.33	0.00	100.00
Upper marginal farmers	37	97.30	0.00	2.70	0.00	100.00
Small farmers	31	96.77	0.00	3.23	0.00	100.00
Medium & large farmers	25	92.00	0.00	0.00	8.00	100.00
All farmers	112	88.39	7.14	2.68	1.79	100.00
BACKWARD VILLAGES						
Agricultural labourers	17	0.00	100.00	0.00	0.00	100.00
Lower marginal farmers	30	46.67	50.00	0.00	3.33	100.00
Upper marginal farmers	28	75.00	25.00	0.00	0.00	100.00
Small farmers	22	100.00	0.00	0.00	0.00	100.00
Medium & large farmers	11	100.00	0.00	0.00	0.00	100.00
All farmers	108	62.96	36.11	0.00	0.93	100.00
ALL VILLAGES						
Agricultural labourers	24	0.00	100.00	0.00	0.00	100.00
Lower marginal farmers	42	57.14	38.10	2.38	2.38	100.00
Upper marginal farmers	65	87.69	10.77	1.54	0.00	100.00
Small farmers	53	98.11	0.00	1.89	0.00	100.00
Medium & large farmers	36	94.44	0.00	0.00	5.56	100.00
All farmers	220	75.91	21.36	1.36	1.36	100.00

Source : Field survey

Table 6 : Transaction Cost of Institutional Loan In Surveyed Villages (Crop Loan Cases)

Category of households	1	2	Number of loan cases	Average number of visit to the bank branches	3	Average days taken for getting the loan*	4	Average hours spent per loan	5	Interest cost	6	Yearly charges per Rs. 100 of institutional loan					Transaction cost	Total cost		
												Value of own labour	7	Bribes offered	8	Other costs			9	10
ADVANCED VILLAGES																				
Lower marginal farmers		11		2.73		32.73		3.07		13.64		0.52		0.00		0.00		0.52		14.16
Upper marginal farmers		37		3.46		18.27		2.03		13.43		0.07		0.12		0.06		0.25		13.68
Small farmers		31		3.19		21.97		2.29		13.92		0.04		1.01		0.16		1.21		15.13
Medium & large farmers		25		3.40		17.44		2.33		13.56		0.03		0.60		0.37		1.00		14.56
All farmers		104		3.29		20.70		2.27		13.63		0.01		0.63		0.23		0.87		14.50
BACKWARD VILLAGES																				
Lower marginal farmers		14		4.07		48.21		2.70		13.50		0.53		0.00		0.00		0.53		14.03
Upper marginal farmers		21		2.67		43.52		2.43		13.55		0.13		0.00		0.00		0.13		13.68
Small farmers		22		2.59		45.32		2.25		13.55		0.09		0.00		0.00		0.09		13.64
Medium & large farmers		11		2.45		41.45		1.37		14.05		0.07		0.00		0.00		0.07		14.12
All farmers		68		2.90		44.74		2.30		13.62		0.03		0.00*		0.00		0.03		13.65
ALL VILLAGES																				
Lower marginal farmers		25		3.48		41.40		2.83		13.56		0.26		0.00		0.00		0.26		13.82
Upper marginal farmers		58		3.17		27.41		2.15		13.47		0.04		0.07		0.04		0.16		13.63
Small farmers		53		2.94		31.66		2.28		13.76		0.03		0.69		0.11		0.82		14.58
Medium & large farmers		36		3.11		24.78		2.10		13.71		0.02		0.47		0.29		0.78		14.49
All farmers		172		3.13		30.20		2.29		13.63		0.01		0.44		0.16		0.61		14.24

Note : * Average days taken for getting the loan is the gap between the date of application for loan and final receipt of loan.
Source : Field survey

Table 7 : Percentages of Defaulters and Defaulted Amount of Institutional Loan

Category of households	Number of loan cases	Percentage of default cases to total loan cases	Average amount outstanding per defaulter	Percentage share in	
				Total defaulters	Defaulted amount
1	2	3	4	5	6
ADVANCED VILLAGES					
Agricultural labourers	7	100.00	286	10.77	0.36
Lower marginal farmers	12	58.33	3386	10.77	4.32
Upper marginal farmers	37	45.95	5006	26.15	15.52
Small farmers	31	58.06	10917	27.69	35.83
Medium & large farmers	25	64.00	15069	24.62	43.96
All farmers	112	58.04	8437	100.00	100.00
BACKWARD VILLAGES					
Agricultural labourers	17	76.47	542	28.26	7.88
Lower marginal farmers	30	60.00	784	39.13	15.79
Upper marginal farmers	28	35.71	3526	21.74	39.42
Small farmers	22	9.09	5000	4.35	11.18
Medium & large farmers	11	27.27	7667	6.52	25.72
All farmers	108	42.59	1944	100.00	100.00
ALL VILLAGES					
Agricultural labourers	24	83.33	453	18.02	1.42
Lower marginal farmers	42	59.52	1513	22.52	5.93
Upper marginal farmers	65	41.54	4458	24.32	18.87
Small farmers	53	37.74	10325	18.02	32.38
Medium & large farmers	36	52.78	13900	17.12	41.41
All farmers	220	50.45	5746	100.00	100.00

Source : Field survey

Table 7.1: Probit Regression Analysis of the Characteristics of Defaulters of Institutional Loan in Surveyed Villages (All Villages)

Explanatory variables	Estimated Coefficients									
	Household operating less than 2.5 acres			Household operating more than 2.5 acres			All Farmers		All Households	
	Eqn. 1 2	Eqn. 2 3	Eqn. 1 4	Eqn. 2 5	Eqn. 1 6	Eqn. 2 7	Eqn. 1 8	Eqn. 2 9		
1										
Operated area [OPAR] (in acres)	-0.62** (-2.01)	-	-0.57** (-1.70)	-	-0.26** (-1.75)	-0.20*** (-1.45)	-	-	-0.23*** (-1.61)	
Education [EDN] (No. of years of schooling)	-0.94** (-1.78)	-0.13* (-2.36)	-0.15*** (-1.31)	-0.15*** (-1.33)	-0.12* (-2.84)	-0.12* (-2.84)	-	-	-0.14* (-3.26)	
Farm business income [FBI] (in Rs.)	-	-0.61*** (-1.57)	-	-0.49*** (-1.52)	-	-0.48* (-2.36)	-0.63* (-3.12)	-0.53* (-2.53)		
Value of non-land income generating assets (in Rs.) [NLIGA]	-	-0.47*** (-1.38)	-	-0.37 (-0.65)	-0.40** (-1.68)	-	-0.39** (-1.89)	-		
Ratio of non-institutional loan to total loan (NITL)	0.13 (0.32)	0.22 (0.51)	-	7.19** (1.89)	-	0.87 (0.21)	0.14 (0.36)	-		
Region [REG] (advanced = 1, backward = 0)	-0.68*** (-1.60)	-0.66*** (-1.51)	-3.29* (-2.41)	-	-0.13 (-0.38)	-0.57*** (-1.46)	-0.56*** (-1.62)	-0.29 (-0.78)		
Intercept	1.01	1.18	0.86	0.81	0.87	0.84	0.41	1.18		
Count R ²	0.71	0.71	0.94	0.94	0.77	0.78	0.75	0.77		
Chi-square (X ²)	15.36*	21.01*	28.90*	29.61*	36.77*	40.49*	40.18*	57.81*		
Degree of freedom	4	5	3	4	4	5	4	4		
Number of observation	113	113	80	80	193	193	202	202		

Notes : *, **, *** indicate significance at 1, 5, 10 per cent levels respectively

Figures in the parentheses represent asymptotic t- ratios.

Table 8A : Estimates of Institutional Credit Gap for Different Categories of Households for Aman Paddy in Surveyed Villages (As Per Scale of Finance)

Category of households	Amount of loan obtained per acre	Scale of finance per acre	Credit gap (in percentage)
1	2	3	4
ADVANCED VILLAGES			
Lower marginal farmers	5689.66	4815.00	18.17
Upper marginal farmers	2744.50	4815.00	- 43.00
Small farmers	2737.15	4815.00	- 43.15
Medium & large farmers	1440.54	4815.00	- 70.08
All farmers	2136.26	4815.00	- 55.63
BACKWARD VILLAGES			
Lower marginal farmers	3975.92	3600.00	10.44
Upper marginal farmers	2556.39	3600.00	- 28.99
Small farmers	1769.01	3600.00	- 50.86
Medium & large farmers	1303.52	3600.00	- 63.79
All farmers	1807.00	3600.00	- 49.81
ALL VILLAGES			
Lower marginal farmers	4474.90	4207.00	6.37
Upper marginal farmers	2641.15	4207.00	- 37.22
Small farmers	2138.71	4207.00	- 49.16
Medium & large farmers	1373.43	4207.00	- 67.35
All farmers	1954.93	4207.00	- 53.53

Source : Field survey

Table 8B : Estimates of Institutional Credit Gap for Different Categories of Households for Boro Paddy and Potato in Advanced Villages only (As Per Scale of Finance)

Category of households	Amount of loan obtained per acre	Scale of finance per acre	Credit gap (in percentage)
1	2	3	4
For cultivation of Boro Paddy			
Lower marginal farmers	0.00	0.00	0.00
Upper marginal farmers	2328.43	8351.00	- 72.12
Small farmers	3041.67	8351.00	- 63.58
Medium & large farmers	4583.33	8351.00	- 45.12
All farmers	3674.54	8351.00	- 56.00
For cultivation of Potato			
Lower marginal farmers	8100.00	15538.00	- 47.87
Upper marginal farmers	5333.95	15538.00	- 65.67
Small farmers	6217.62	15538.00	- 59.98
Medium & large farmers	6265.49	15538.00	- 59.68
All farmers	6125.54	15538.00	- 60.58

Source : Field survey

Table 9 : Estimates of Institutional Credit Gap Under Alternative Concepts for Different Categories of Households (For All Crops Together)

Category of households	Institutional	Institutional loan		Credit Gap	
	loan obtained	<u>required per acre</u>		<u>(percentage)</u>	
	per acre (in Rs.)	R_1	R_2	G_1	G_2
1	2	3	4	5	6
ADVANCED VILLAGES					
Lower marginal farmers	3456.66	4091.19	8121.26	-15.50	-57.43
Upper marginal farmers	1721.71	2625.90	6277.62	-34.42	-72.57
Small farmers	2338.76	2480.60	6284.79	-5.71	-62.78
Medium & large farmers	1456.62	2686.05	6230.99	-45.76	-76.62
All farmers	1770.41	2746.01	6453.46	-35.54	-72.57
BACKWARD VILLAGES					
Lower marginal farmers	1597.93	1485.25	4234.46	7.59	-62.26
Upper marginal farmers	1354.96	1295.37	4089.65	4.60	-66.87
Small farmers	1237.30	1421.58	4557.78	-12.98	-72.86
Medium & large farmers	904.26	1383.10	4754.86	-34.64	-80.99
All farmers	1241.90	1389.49	4378.52	-10.61	-71.63
ALL VILLAGES					
Lower marginal farmers	2396.46	2432.87	5647.84	-1.52	-57.58
Upper marginal farmers	1582.36	2098.71	5410.69	-24.62	-70.76
Small farmers	1819.86	1951.09	5421.28	-6.72	-66.43
Medium & large farmers	1287.86	2191.83	5671.08	-41.24	-77.29
All farmers	1535.31	2122.74	5500.11	-25.99	-72.08

Notes : (1) R_1 and R_2 indicate institutional loan required (in Rs.) as per 'HYV input cost' and 'Paid-out cost' concepts respectively.

(2) G_1 and G_2 indicate measures of institutional credit gap based on the above two concepts.

Source : Field survey

Welfare Gains (or Losses) to the Producers and Consumers in the Absence of Rationing A Case Study in Burdwan District of West Bengal.

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Abstract

In the recent years it is seen that many poor people are not willing to draw their full quota of ration food grains due to various reasons like lower quality of ration food grains, substantial amount of leakages, irregular supply of ration food grains, problems of mistargeting the poor etc. The burden of food subsidy of the Government is increasing continuously due to this scheme. So question arises whether Public Distribution System should be continued or not. Here, based on sample survey, this study estimates the welfare gains (or losses) to the producers and consumers in the absence of rationing over the current levels under rationing in Burdwan District of West Bengal. That is, in this study we want to examine whether welfare of the producers and consumers increases or not due to the abolition of rationing. It will indicate the importance of Public Distribution System in the Burdwan District of West Bengal.

1. Introduction

Nobody would deny the fact that Public Distribution System is an important measure and tool to provide food security to the poor people of the country like India. The Public Distribution System is a part of the welfare attempt of the Government to provide food and as maximum as possible required calorie to the beneficiaries of the public distribution. There is no doubt, that despite the honest and sincere effort on the part of the Government, it may be quite impossible to meet the full requirement of food of all the poor households in the country. That is why there is always an attempt on the part of the Government to supply some minimum quantity of food grains or what may be called "quota" to the households who hold some documents in the form of ration cards and certificates of their income status as to belong to the B.P.L category. The Public Distribution System is fully effective, if those for whom it is meant can reap its benefits.

But in the recent years the effectiveness of Public Distribution System is often questioned because of its potential impact on the consumption level of the consumer target group, its impact on other sectors of the economy, its cost, and its compatibility with the other food security measures etc. So based on sample survey we want to estimate welfare gains (or losses) to the producers and consumers in the absence of rationing over the current levels under rationing in Burdwan District of West Bengal. That is, in this study we want to examine whether welfare of the producers and consumers increases or not due to the abolition of rationing.

But due to the absence of analytical procedures and required data we can not quantify the full impact of rationing (both the direct and indirect income distribution gains of rationing). So here the gains of rationing are measured through income gains or losses to both producers and consumers. These measures provide a partial estimate of the impact of a dual price system and therefore can not be used to compare the efficiency loss of the dual market mechanism with a

free market. The basic approach followed here is to estimate the changes in farm income and consumer expenditures in the absence of rationing over their current levels under rationing. Here, we assume that there is some momentary equilibrium. Moreover, it is also assumed that supply elasticity is zero. P.S.George (1979), followed this approach for Kerala in case of rice only. But here we consider this approach both for rice and wheat in the Burdwan District of West Bengal.

This paper is divided into different sections. In section-2 we discuss the methodology of the study. Section -3 deals with the determinants of producer gains (or losses) and consumer gains (or losses) in the absence of rationing. In section - 4 we construct some equations to estimate rationing gains (or losses) of the producers and consumers (in the absence of rationing). Empirical results are described in section -5. Lastly in section-6 we draw a conclusion of this study.

2. Methodology

In this study we collect data by personal interview method. So this study mainly depends on the primary data. Respondents are not always accurate in response to our enquiry. So there may be some sort of discrepancy or bias in this case. We have tried to minimize the bias by cross checking. Here we consider only the poor families, who belong to the B.P.L category. In our study we selected 300 representative households (who belong to the B.P.L category officially as per definition of Rs. 15000/- as income per annum of the head of the family) randomly from the District of Burdwan, West Bengal during the month of November, 2004. Similarly, we also collect data regarding production level, amount of levy, farm level price, levy price, open market sales etc. from the farmers selected randomly from some selected villages in the Burdwan District of West Bengal during this period. This is done with an objective of estimating the welfare gains (or losses) to the producers and consumers in the absence of rationing over the current levels under rationing in the Burdwan District of West Bengal.

3. Determinants of Producer Gains (or Losses) and Consumer Gains (or Losses) in the Absence of Rationing

In order to determine the income gains (or losses) of the producers in the absence of rationing over the current levels under rationing we have to estimate the income of the producers both in the presence and absence of rationing. The income level of the producers in the presence of rationing is influenced by farm level price under rationing, levy price, open market sales under rationing and levy sales. On the other hand, the income level of the producers in the absence of rationing is influenced by open market sales and farm level price in the absence of rationing. In the absence of rationing the producers sold their entire amount of marketable surplus in the open market. But in the presence of rationing the producers can not sell their entire amount of marketable surplus in the open market. The Government collects a part of their marketable surplus as levy. Here

we see that levy price is lower than the farm level price (both in the presence and absence of rationing). But we can not say certainly whether farm level price in the presence of rationing is higher or not than the farm level price in the absence of rationing. The market demand is likely to fall in the presence of rationing as a part of the demand is fulfilled through rationing. But supply does not remain constant as levy has been collected from the producers. So supply also falls. On the other hand, in the case of absence of rationing marketable surplus is high as there is no levy in this case. But in this case market demand is also high because the poor people can not get food grains from the ration shops. So they have to depend completely on the open market. In order to determine the farm level price in the absence of rationing we have to consider the farm level price of the neighbourhood state as a proxy. Here we consider farm level price of Bihar as a proxy because the performance of Public Distribution System is very poor in Bihar. Lower quality of ration food grains, substantial amount of leakages, irregular supply of ration food grains, lack of proper targeting of the poor, etc make it inoperative in Bihar. Corruption level is also very high in Bihar in the distribution of ration cards (Jos Mooij, 1994). The difference between the income level of the producers in the absence of rationing and income level of the producers in the presence of rationing will give us the income gain (or loss) of the producers in the absence of rationing over the current levels under rationing.

In order to measure the welfare gain of the consumers in the absence of rationing we have to consider expenditure of the consumers both in the presence and absence of rationing. In the absence of rationing the consumers have to purchase their entire amount of food grains from the open market at higher prices (national free market price). In this case consumer's expenditure depends on open market purchase and national free market price. But in the presence of rationing consumer's expenditure depends on open market purchase, ration purchase, open market price under rationing and ration price. In this case the poor consumers can get a part of their food grains from the fair price shops at a very subsidized rate. The remaining part they can purchase from the open market at open market price. But if the poor consumers deliberately give up their ration quota and purchase their entire essential commodities through the open market, then their consumption level may fall considerably because open market price is substantially high than the ration price. Here we can not say certainly whether open market price (in the presence of rationing) will be higher than the national free market price (open market price in the absence of rationing) or not.

4. Rationing Gains (or Losses) to the Producers and Consumers (in the Absence of Rationing)

Farm incomes with and without rationing is estimated in order to determine the income gain to the producers as a result of abolition of rationing. The estimated income gain to the producers as a result of the abolition of rationing over the actual income realized under rationing is defined as

$$W_p^R = \sum_{i=1}^n \left\{ (q_{0i}^R + q_h^R) P_{f0}^R - q_{0i}^R P_{fr}^R - q_h^R P_l^R \right\}$$

$$\therefore W_p^R = \sum_{i=1}^n q_{0i}^R (P_{f0}^R - P_{fr}^R) + \sum_{i=1}^n q_h^R (P_{f0}^R - P_l^R) \dots\dots\dots (1)$$

Where,

W_p^R = Producer gain (or loss) in case of rice.

q_{0i}^R = Quantity of paddy sold in the open market by farmers belonging to ith area group.

P_{f0}^R = Farm level price of paddy in the absence of rationing.

P_{fr}^R = Farm level price of paddy under rationing.

q_h^R = Quantity of paddy sold under levy in the ith group.

P_l^R = Levy price of paddy.

Similarly, for wheat we get:-

$$W_p^W = \sum_{i=1}^n \left\{ (q_{0i}^W + q_h^W) P_{f0}^W - q_{0i}^W P_{fr}^W - q_h^W P_l^W \right\}$$

$$\therefore W_p^W = \sum_{i=1}^n q_{0i}^W (P_{f0}^W - P_{fr}^W) + \sum_{i=1}^n q_h^W (P_{f0}^W - P_l^W) \dots\dots\dots (2)$$

Where the symbols have their usual meanings.

So the total gain (or loss) to the producers as a result of abolition of rationing over actual income realized under rationing is given by:-

$$W_p = W_p^R + W_p^W \dots\dots\dots (3)$$

The gain (or loss) to the consumers as a result of the abolition of rationing is defined as the difference between the consumer expenditures with and without rationing. Now, the consumer gain (or loss) in case of rice is given by:-

$$W_C^R = q_R^r (P_R^r - P_R^*) + q_R^m (P_R^m - P_R^*) \dots\dots\dots (4)$$

Where,

W_C^R = Consumer gain (or loss) in case of rice.

q_R^r = Quantities of rice distributed through ration shops.

P_R^r = Ration price of rice.

P_R^* = Open market price of rice in the absence of rationing.

P_R^m = Open market price of rice under rationing.

q_R^m = Quantities of rice purchased from the open market.

Similarly, for wheat we get:

$$W_C^W = q_W^r(P_W^r - P_W^*) + q_W^m(P_W^m - P_W^*) \quad \dots\dots\dots (5)$$

Where the symbols have their usual meanings.

So the total gain (or loss) to the consumers as a result of abolition of rationing is given by:

$$W_C = W_C^R + W_C^W \quad \dots\dots\dots (6)$$

The total gain (or loss) to the producers and consumers as a result of abolition of rationing is defined as

$$W = W_P + W_C \quad \dots\dots\dots (7)$$

5. Empirical results

In our study we estimate producer gains (or losses) in the absence of rationing over the current levels under rationing both for paddy and wheat. Similarly, we also estimate consumer gains (or losses) in the absence of rationing over the current levels under rationing both for rice and wheat.

Here we see that net producer gains are positive both for paddy and wheat in the absence of rationing. So producer gains will increase in the absence of rationing. But from the stand point of net consumer gains we see that it is negative both for rice and wheat in the absence of rationing. So expenditure of the consumers will increase in the absence of rationing. The sum total of net producer gains (or losses) and net consumer gains (or losses) gives us the total gains (or losses) of the economy in the absence of rationing. Here we see that the total gain is negative in the absence of rationing. So we can say that total welfare of the economy will decrease in the absence of rationing.

Table – 1

Gains (or Losses) to the Producers (for the Representative Farmers in the Absence of Rationing) in the Case of Rice in the District of Burdwan , West Bengal, During 2004 – 2005.

Items	Rupees/Kilogram
Assumed farm level price of paddy in the absence of rationing (P_{fo}^R)	6.00
Farm level price of paddy under rationing (P_{fr}^R)	6.50
Levy price of paddy (P_l^R)	5.30
Gap between assumed farm level price and levy price of paddy ($P_{fo}^R - P_l^R$)	.70
Gap between assumed farm level price and actual farm level price of paddy ($P_{fo}^R - P_{fr}^R$)	- 0.50
Items	Rupees
Producer gains (or losses) on levy sales of paddy	4834.80
Producer gains (or losses) on open marker sales of paddy	- 2342.50
Net producer gains (or losses) in the case of paddy (W_p^R)	2492.30

Note: A negative sign indicates a net loss to producers.

Source: Sample survey

Table – 2

Gains (or Losses) to the Producers (for the Representative Farmers in the Absence of Rationing) in the Case of Wheat in the District of Burdwan, West Bengal, During 2004 – 2005

Items	Rupees/Kilogram
Assumed farm level price of wheat in the absence of rationing (P_{fo}^W)	6.30
Farm level price of wheat under rationing (P_{fr}^W)	6.50
Levy price of wheat (P_l^W)	6.20
Gap between assumed farm level price and levy price of wheat ($P_{fo}^W - P_l^W$)	0.10
Gap between assumed farm level price and actual farm level price of wheat ($P_{fo}^W - P_{fr}^W$)	- 0.20
Items	Rupees
Producer gains (or losses) on levy sales of wheat	1470.40
Producer gains (or losses) on open marker sales of wheat	- 936.00
Net producer gains (or losses) in the case of wheat (W_p^W)	534.40

Note : A negative sign indicates a net loss to producers.

Source: Sample survey

Table – 3

Gains (or Losses) to the Consumers (for the Representative Households in the Absence of Rationing) in the Case of Rice in the District of Burdwan, West Bengal, During 2004 – 2005.

Items	Rupees/Kilogram
Assumed open market price of rice in the absence of rationing (P_R^*)	9.00
Ration price of rice (P_R^r)	6.15
Actual open market price of rice (P_R^m)	10.00
Gap between ration price and assumed open market price of rice ($P_R^r - P_R^*$)	- 2.85
Gap between actual open market price and assumed open market price of rice ($P_R^m - P_R^*$)	1.00
Items	Rupees
consumer gains (or losses) on ration purchase of rice	- 8105.40
consumer gains (or losses) on open market purchase of rice	4685.00
Net consumer gains (or losses) in the case of rice (W_C^R)	- 3420.40

Note: A negative sign indicates a net loss to consumers.

Source: Sample survey

Table – 4

Gains (or Losses) to the Consumers (for the Representative Households in the Absence of Rationing) in the Case of Wheat in the District of Burdwan, West Bengal, During 2004 – 2005.

Items	Rupees/Kilogram
Assumed open market price of wheat in the absence of rationing (P_W^*)	7.00
ration price of wheat (P_W^r)	4.65
Actual open market price of wheat (P_W^m)	8.00
Gap between ration price and assumed open market price of wheat ($P_W^r - P_W^*$)	- 2.35
Gap between actual open market price and assumed open market price of wheat ($P_W^m - P_W^*$)	1.00
Items	Rupees
Consumer gains (or losses) on ration purchase of wheat	- 4319.30
Consumer gains (or losses) on open market purchase of wheat	3120.00
Net consumer gains (or losses) in the case of wheat (W_C^W)	- 1199.30

Note: A negative sign indicates a net loss to consumers.

Source: Sample survey.

Table – 5

Total Welfare Gains (or Losses) to the Producers and Consumers (for the Representative Farmers and Households in the Absence of Rationing) in the Case of Rice and Wheat in the District of Burdwan, West Bengal, During 2004 – 2005.

Items	Rupees/Kilogram
Net producer gains (or losses) in the case of paddy (W_p^R)	2492.30
Net producer gains (or losses) in the case of wheat (W_p^W)	534.40
Net consumer gains (or losses) in the case of rice (W_c^R)	- 3420.40
Net consumer gains (or losses) in the case of wheat (W_c^W)	- 1199.30
Items	Rupees
Total producer gains (or losses) ($W_p = W_p^R + W_p^W$)	3026.70
Total consumer gains (or losses) ($W_c = W_c^R + W_c^W$)	- 4619.70
Total Welfare gains (or losses) ($W = W_p + W_c$)	- 1593.00

Note: A negative sign indicates a net loss.

Source: Sample survey

1. Conclusion

From the above analysis it is seen that total gain of the economy is negative in the absence of rationing. This means that net loss of the consumers is much more than the net gain of the producers in the absence of rationing. So welfare of the economy will decrease if we abolish rationing system completely. So we can safely assert that rationing system is very much essential for raising the consumption level of the poor section of the economy. But in the recent years we see that Public Distribution System is suffering from some problems, which are largely due to general pattern of Government inefficiency. The reasons for failure may be economic stagnation, underdevelopment and the changing political landscape. Specificities of a particular state should have to be taken into account. We would suggest, in this context therefore, that the rationing system should not be abolished rather be improved by removing the loopholes inherent in the system. Effective functioning of the Public Distribution System would lead to adequate increase in demand. It would also avoid the paradoxical situation of wide spread hunger alongside mounting stocks of food grains.

Finally, it may be noted that Public Distribution System is not the only answer for improving food security of the poor because it can help only those who have purchasing power. Other anti-poverty programs have to be strengthened as part of the economic reforms for creating income generation among the poor and vulnerable sections of the people.

Bibliography

1. Balakrishnan, Pulapre and Bharat Ramaswami (1997), "Quality of Public Distribution System: Why it Matters", *Economic and Political Weekly*, vol. XXXII, January 25, 1997, pp. 162 – 165.
 2. Dev, S. Mahendra (1998), "Public Distribution System: Impact on Poor and Options for Reform", *Economic and Political Weekly*, vol. XXXIII, No. 35, August 29 – September 4, pp. 2285 – 2290.
 3. George, P.S. (1979), "Public Distribution and Food Grains in Kerala – Income Distribution Implications and Effectiveness" (Research Report).
 4. George, P.S. (1984), "Some Aspects of Public Distribution System in India", *Economic and Political Weekly*, September 29, vol. 19, No. 39.
- Mooij, E. Jos (1994), "Public Distribution System as a Safety Net: Who is Saved?", *Economic and Political Weekly*, vol. 29, No. 3.

Quantitative economics and its constraining assumptions : The way out

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Abstract

This Paper makes an attempt to look at the essence of quantitative economics and also its various dimensions with a focus on a number of its constraining assumptions, and then, as a way out, it emphasizes qualitative economics, of course with its limitations too.

Despite the facility of mathematics and statistics in economics, coupled with the fact that economics is inherently mathematical, quantitative economics is greatly constrained by a number of both built-in and other assumptions with the result that it invariably fails to reflect reality. These assumptions relate to quantification of economic and social variables, fixing the sample size, collection of data, and finally to analysis of data.

Believing in the theory of the second best, the built-in difficulties of quantitative economics, as pointed out above, make us rely more on qualitative economics for better and effective diagnosis of the economic and social problems. Qualitative studies in economics are rather indicative. They optimally mix economic theory with the researcher's own experience of the given context, perhaps through his insights and vision, and also on some kind of a feedback he gets from the concerned respondents.

But even qualitative studies have their own limitations, which can perhaps be easily avoided by taking little extra care. One of the crucial limitations is perhaps the *intended* indifference (and sometimes the ignorance) of researchers towards certain basic/built-in assumptions of the given context. In most of the cases, exclusion of these assumptions from the basic text, eventually lead to acute contradictions and inconsistencies between the stated goals and the actual policy. No matter what the context is, such built-in assumptions are always there.

The science of economics has two important facets: quantitative and qualitative. Both are linked with and based on economic theory. Economic theory can, therefore, be understood and analyzed either quantitatively or qualitatively. The distinction is basically in terms of measurement. Quantitative economics relies on measurement, whereas qualitative economics is completely devoid of any measurement. Quantitative economics is, thus, both mathematical and statistical, while qualitative economics is only mathematical. The best analogy to understand the difference between the two can also be drawn from diagnostic medical sciences. While quantitative economics is like pathology, qualitative economics is just indicative, and is akin to pulse-reading, and other symptomatic assessments.

The purpose of this paper is to look at the various dimensions of quantitative economics with a focus on a number of its constraining assumptions, and then, as a way out, it emphasizes qualitative economics, of course with its limitations too.

The Essence of Quantitative Economics

Quantitative economics has in fact three viewpoints, that of economic theory,

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mathematics, and statistics. Experience has shown that each of these is a necessary, but not by itself sufficient, condition for a real understanding of the quantitative relations in modern economic life. It is the mix and unification of all the three that is what matters the most. It is this unification that we term as econometrics (Frish, 1933)². The viewpoint that relates to mathematics is best understood by answering two basic questions: (a) why is it that mathematics is highly useful in economics? and (b) why is it that mathematics is inherent in economics? We shall try to answer both of these questions³.

The use of mathematics in economics in a broad sense is probably as old as economics itself, but in the beginning, around the last quarter of the nineteenth century, at the time of the advent of the mathematical school led by A. Cournot, and joined later by M.E. Walras, W.S. Jevons, A. Marshall, V. Pareto and F.Y. Edgeworth, only rudimentary mathematics was used. Cournot was the first to treat the theory of the firm in a mathematical form. He set out the variables and functions facing a firm. He also made use of calculus to show that a monopolist maximizes his net revenue at an output when marginal cost (of production) equals marginal revenue (of production). He also provided a mathematical solution to the case of duopoly. Walras constructed for the first time a mathematical model of general equilibrium in terms of a set of simultaneous equations under which he showed that prices and quantities are uniquely determined. Jevons along with C. Menger, H.H. Gossen, and M.E. Walras propounded the marginal utility theory and set it in mathematical terms. Jevons is also regarded as one of the founders of econometrics. He introduced the concept of moving averages and contributed immensely towards the study of statistics for empirical economics. Marshall developed and refined microeconomic theory and in the process provided a mathematical background to quite a number of economic theories. He invented the concept of elasticity as it is used now in economics. Pareto developed analytical economics. His contributions in the field of indifference curves are highly recognized even today. Edgeworth invented the method of indifference curves. He also introduced contract curves and made important contributions in the field of statistics. It was only in the 1930s that a substantial use of mathematics was made, and most of the economic doctrines were formulated in mathematical terms by economists like, J.R. Hicks, J.M. Keynes, R.F. Harrod, R.G.D. Allen, E. Slutsky, and W.W. Leontief. Hicks extended the use of indifference curves and demonstrated how consumer behaviour can be analyzed on the basis of ordinal concept of utility. He further showed by the help of mathematical models how total output is affected by the accelerator. Keynes in his books "A Treatise on Money" published in 1930, and "The General Theory of Employment, Interest and Money" published in 1936 liberally used mathematics to crystallize his views about quite a number of macro problems including those of unemployment, trade cycle, and rate of interest. Harrod

2 See Koutsoyiannis (1988), Page 3.

3 For this see Dowling (1980), and Chand and Anand (1981), Pages 1-5.

provided a mathematical framework to the theory of growth. Allen produced excellent books like "Mathematical Analysis for Economists"(1938), "Statistics for Economists"(1949), "Mathematical Economics" (1956), "and Macro Economic Theory- A Mathematical Treatment" (1967), and gave a new dimension to the study of economics. Slutsky made important contributions to statistics especially in the fields of probability, time series, and serial correlation. Leontief in his book " The Structure of the American Economy 1919-1929" produced an input-output model of the United States of America, and recommended the use of matrix algebra to simplify the complexities of a modern economy arising essentially from the interdependence of its various sectors. Since the 1950s the extent and depth of mathematics in the field of economics has tremendously increased and economics has become increasingly mathematical. Most of the new economic doctrines are set in highly mathematical terms. The contributions of Milton Friedman, P.A. Samuelson, M. Kalecki, A.Wald, Louis M. Court, Kenneth J. Arrow, William J. Baumol, Nicholas Kaldor, George Stigler, Joan Robinson, Fritz Machulp, G.C. Archibald, and J. Tinbergen are noteworthy in this respect. Apart from refining the already existing economic doctrines by introducing mathematical methodology these economists have, by and large, extended the frontiers of economics in various ways.

This brief preview naturally takes us to question (a) as posed above. The basic reason as to why mathematics is highly useful in economics is that its language is very much suitable to explain and analyze the abstract reasoning which is so essential to economics. It is the intellectual process where human mind withdraws some of the aspects of objects of study from the others and concentrates on them to the exclusion of the rest. And this is very easily achieved by mathematics. An example will make this clear. In macroeconomics when we study the working of an economic system in terms of the theory of the circular flow of income we identify its important features, some of which are:

- the physical flow of productive services (labour, enterprise etc.) from the households to business firms and the reverse flow of money payments (wages, salaries, profits etc.) from business firms to households;
- the physical flow of consumer goods and services from business firms to households and the reverse flow of money payments from households to business firms.

At the same time we ignore (or exclude) certain other features, which are of lesser importance for purposes of establishing the basic theory of the circular flow of income. For example, we exclude the fact that

- product also originates from sectors (like, Government, and Rest-of the World) other than household and business firms;
- saving also occurs in the system

This is just one example. There are many other examples that can be drawn to demonstrate the use of abstract reasoning in economics. Economic theory is,

in fact, fully based on abstract reasoning. If there is no abstract reasoning there is no economics. All the principles and precepts of economic theory always distinguish between two sets of variables: endogenous (determined or explained), and exogenous (determining or explanatory). Endogenous variables cannot be determined unless there are exogenous variables. The assumption of *ceteris paribus* (other things being given) is the *summum bonum* (the ultimate determining principle) of economic theory. No theory can be propounded unless some of the variables are excluded as given. It is only then that the included variables get determined, of course subject to the excluded variables. This principle of endogeneity (inclusion) and exogeneity (exclusion) is the basis of all theoretical formulations in economics, no matter what the context is. All the contexts of economic theory stem from this principle. Abstract reasoning thus constitutes the core of all economic theory. The reasons why mathematics gets an edge over other methods, as far as abstract reasoning is concerned, are briefly mentioned below:

- Mathematics is precise and explicit: Mathematical explanations of economic terms (like, equilibrium-partial and general, stable, unstable and neutral, static and dynamic, comparative statics, total, marginal, and average values, elasticity, maximization and minimization, constrained optimization, compounding and discounting, growth rates, shadow pricing, the primal and the dual, multipliers and accelerators, consumers' and producers' surplus) are unique and, as such, do not lead to misleading conclusions.
- Mathematics facilitates presentation and understanding of terse and difficult concepts: It has been found that mathematical presentation of economic concepts and data (by way of functions, equations, and identities, graphs, charts, pictograms, and bar and schematic diagrams) simplifies their understanding and facilitates economic thinking.
- Mathematics rationally and logically explains the behaviour of rational economic agents: Rationality is the basis of all economic agents who behave like logicians and mathematicians. The assumption of rationality and of maximizing/minimizing/optimal behaviour is the basic assumption of economics, which is met when the three axioms of *completeness, transitivity, and continuity* are met. We talk of rational consumers, producers, sellers, buyers and entrepreneurs both at the micro and macro levels. Their behaviour is most logical and can easily be explained by the methods of logic and mathematics.

Another important attribute of economics is that it is inherently mathematical. Mathematics is inbuilt in economic thinking and reasoning and automatically creeps in as a default. Some of the illustrations are given below:

- Dependence of one economic variable on others, which is so common in economics, leads to the mathematical application of functional relationships;

- Equilibrium in supply and demand analysis in a single market amounts to equating the supply and demand functions, and then solving the resulting linear equation in one unknown;
- Equilibrium in supply and demand analysis in n markets amounts to equating the supply and demand functions of the n markets, and then solving the resulting set of n simultaneous equations in n unknowns;
- The determination of consumer's equilibrium by the method of indifference curves amounts to finding the tangential point of the given price line and the highest possible indifference curve;
- The determination of seller's equilibrium amounts to differentiating his net revenue function;
- The determination of all marginal concepts amounts to differentiating the relevant total functions;
- The determination of optimal values amounts to the application of the mathematical theory of constrained maxima;
- Determination of consumers' and producers' surplus amounts to the evaluation of the corresponding definite integral;
- Multi-variate relations (like production functions, utility functions) can best be analyzed by the methods of partial and total differentiation;
- In growth economics the use of difference and differential equations facilitates the understanding of both simple and compound economic growth;
- Exponential and logarithmic functions are quite useful for determining the rate of growth of quantities like, population, national income, and investment;
- The use of matrix algebra simplifies complex economic situations of comparative static analysis, interacting markets, and international trade.

We now briefly look at the link between mathematics and economic statistics. Talking of economics, statistics has two aspects: one is economic or utilitarian, relating to collection of information concerning social and economic conditions, and the other is mathematical and logical, relating to the concept of random events in connection with the theory of probability and sampling. The first is called economic statistics and refers to the real world, and the second is called mathematical statistics, and refers to the world of abstract mathematics and logic. Both in fact go together. Most of the economic aggregates (like, national income, consumption, investment, expenditure, employment, money, imports, exports, balance of payments, price level, population) and their inter-linkages are best summarized and analyzed by the use of mathematics. And then comes the concern of the statistician who devises methods of collecting data and then analyzing these optimally. The whole process consists firstly in providing mathematical

formulation to the various economic aggregates and theories, and then analyzing them statistically on the basis of the relevant economic data. The reverse process of going back from statistical analysis to the basic economic thinking, of course via mathematics, is also very important. In essence, therefore, economic statistics in itself achieves nothing, if the methods of mathematics are not employed to extract the desired information from the observed facts.

Economic statistics initially involves collection, editing, approximation, classification, seriation, and tabulation of data, and then comes the preliminary analysis of the collected data in terms of ratios, percentages, logarithms, moving averages as the need may be, and even finding their means and other measures of central tendency, and measures of dispersion, before the data become suitable for economic interpretation. In order that we may not use a wrong method to analyze a given set of data after it has been refined as suggested above, we must know how exactly these quantities (like, measures of central tendency, and measures of dispersion) vary as a result of some variation in the data-set on which they are based. For this purpose certain results of the theory of probability become very useful. After processing and undertaking preliminary scrutiny, the methods of time series, regression, and correlation are used to determine the trend and trend values of the given data set. Here we use more advanced methods of mathematics, and in essence operate in the sphere of econometrics.

The Constraining Assumptions

Despite the facility of mathematics and statistics in economics, coupled with the fact that economics is inherently mathematical, quantitative economics is greatly constrained by a number of both built-in and other assumptions with the result that it invariably fails to reflect reality. These assumptions relate to quantification of economic and social variables, fixing the sample size, collection of data, and finally to analysis of data. We shall now briefly elaborate on these:

Quantification of Economic Variables: As we have said earlier collection of data is basic to economic statistics, and before this is done economic and social variables have to be numerically quantified. There are a large number of variables that can be quantified directly without the use of any substitute or alternative variables, also termed as proxy variables, but there are occasions when, due to either practical difficulties in the collection of data in respect of certain variables, or due to the impossibility of direct quantification of many other variables, we have to rely on indirect quantification through the use of proxy variables. For example, variables like, income, output, and expenditure can be directly quantified, but in certain situations when we believe that the respondents will not correctly indicate their income, output, and expenditure due to say, tax problems, we have to collect the required information on these variables through indirect means by asking indirect questions using the directly measurable proxy variables (like, hours of work and leisure, number of employees, amount of raw material bought, means of entertainment in the household) that would approximately reflect the values of their income, output, and expenditure. On

the other hand, there are many other variables, which cannot be quantified directly, and as such, we have to rely only on their proxy variables. For example,

- Standard of living can best be assessed through the use of proxy variables like, income, consumption expenditure, housing and furnishing cost, and many such directly measurable variables;
- Concealed poverty⁴ can only be assessed through proxy variables like, the number of poor involved in debt-trap, and in criminal and unethical activities;
- Extent and degree of corruption⁵ in a given system, which is beyond any direct measurement, can be assessed only through the use of
 - (i) proxy instruments based on written documents (like, press reports, opinion polls, court proceedings and judgments, judicial records, records from anti-corruption agencies), and even television talk shows and inside stories;
 - (ii) certain indices like the Corruption Perception Index (CPI), as used and published by Transparency International in 1995, and later updated in 1996 and 1997, and even beyond that, and the Business International index (BII) as used by Business International, a subsidiary of the Economist's Intelligence Unit, and the Global Competitive Report Index (GCRI) as based on a 1996 survey of firm managers who were queried on the extent of corruption relating to various aspects of business.

There is no dearth of such examples in economic and social studies. Proxy variables can either be close or remote/distant. Larger is the number of proxy variables, and more distant/remote they are; less genuine become the results of the given quantitative assessment.

Fixing the Sample Size⁶:

In any quantitative study, based on sampling, correct sample size is a must to have a specified degree of precision. Theoretically speaking, the sample size depends on the

- (a) costliness of errors in the estimate, and
- (b) costliness of sampling.

Mansfield (1991) says, "*if substantial errors in the estimate will result in large penalties, the optimal sample size will tend to be large because the cost of increased sample size is likely to be outweighed by the resulting reduction in the sampling errors contained in the estimate.*" He further says, "*if it is relatively*

4 See Anand, 2002

5 See Anand, 2001

6 For a preliminary analysis of this see Mansfield, 1991, Pages 289-90, 348

inexpensive to increase the sample size, the optimal sample size will tend to be larger than if it is relatively expensive to do so." There has to be, therefore, an optimal trade-off between these two determinants of the sample size.

Practically speaking, exact determination of sample size basically depends, apart from other factors, on the standard deviation of the population from which the sample has to be drawn, and also on the probability error. In general, if it is desired that the probability be $(1 - \alpha)$ that the sample mean differs from the population mean by no more than some number δ , the sample size must equal

$$n = \left(\frac{z_{\alpha/2} \sigma}{\delta} \right)^2$$

where, σ is the population standard deviation and $z_{\alpha/2}$ is the value of the standard normal variable which has a probability $\alpha/2$ of being exceeded.

This assumes that the sample is large and that the population is large relative to the sample. In other words, it means that the largeness of the sample size depends on the largeness of the population and, hence, its standard deviation.

In most of the cases the population standard deviation is not known, and, hence, sample size cannot be exactly fixed. Even when the population standard deviation is known, researchers do not much bother about the exact sample size because of their own convenience, both in terms of time and cost.

Collection of Data:

The basis of all statistics is systematic collection of numerical facts. It is only then that the methodology of statistics becomes operative, and helps us, though approximately, to draw facts from figures. Although statistics as a science suffers from many drawbacks, yet according to Moroney (1977) it always remains both desirable and undesirable. It is desirable because it offers a method of investigation, which is used when other methods fail; it is often a last resort. On the other hand, it is undesirable because it is quite often used to mislead and interpreted to misinterpret, especially by the State say, in terms of many parameters like, taxation, inflation rates and price indices, poverty levels, inequality ratios, unemployment, rate of growth, and so on.

Collection of data itself is highly problematic in various ways. There is always an error either due to wrong questions, and, therefore, wrong responses, or due to negligence of the field workers. The question of primary and secondary data is also crucial. In the case of primary data, although the likelihood of errors is much less as compared to secondary data, yet it is neither feasible nor easy (both in terms of money and time cost) for every researcher to collect primary data. And, as such, in most of the cases, one has to rely on secondary data, and, somehow, reconcile with the in-built inaccuracies at a very high 'academic' cost. There is also another general constraint, which relates to the absence of any link, whatsoever, between the producers of data (like, the Central Statistical

Organization, the National Sample Survey Organization, and such other institutions), on the one hand, and the users of such data, on the other (Anand, 1981).

Beyond that it is a known fact (Reid, 1993) that the quantitative aspects of the science of economics are not fully fledged scientific because its data depend to a large extent on legal statutes, tax codes, and political regimes. Its theories are not always defined in terms of variables with agreed procedures and measurement, and the testing of its theories is rarely decisive. Beyond that, it operates within a larger system of political economy (Anand, 1996), and, as such, most of its prescriptions get distorted.

Analysis of Data:

Moroney (1977) has very aptly summed up the essence of statistical analysis, when he says that *"a statistical analysis, properly conducted, is a delicate dissection of uncertainties, a surgery of suppositions. The surgeon must guard carefully against false incisions with his scalpel. Very often he has to sew up patient as inoperable."* He further says that a statistician should be like *"a scientist with no axe to grind other than the axe of truth and no product to advertise save the product of honest and careful enquiry."*⁷

But no matter what it is, statistical methodology and, therefore, statistical analysis is subject to many unreal assumptions. Some of the contexts of these assumptions are briefly mentioned below:

- Construction of Frequency Distributions: Once the data set is available, it has to be condensed by some method of ranking or classification before its characteristics can be comprehended. This method of ranking or classification of a given variable (continuous or discrete) takes the form of what is termed as frequency distribution of the given variable, which spells the manner in which class-frequencies are distributed over the class-intervals of that variable. This involves fixing the scale class-interval, and also the position of intervals. It is then that the observations are classified. They are also then graphically represented through frequency curves, polygons and histograms. These various steps in the construction of frequency distributions involve many assumptions, which may not be true in real life.
- Types of Frequency Distributions: There are four broad categories of frequency distributions: the symmetrical, the moderately symmetrical or skew, the extremely symmetrical or J-shaped, and the U-shaped. We do find examples of these in real life, but they sometimes occur in an incomplete form because of certain limitations on the range of the variate, resulting in truncated forms. We also sometimes get complex

⁷ See Moroney (1977), Page 3.

distributions, which are a distorted mix of other normal varieties. We also get examples of pseudo-frequency distributions where the variate is not strictly speaking measurable, as in psychology or even economics.⁸

- **Theoretical Distributions:** Frequency distributions are normally constructed from a given set of data, but it is also possible to mathematically deduce what the frequency distributions of certain population should be, subject to certain general hypotheses. Such distributions are called theoretical distributions. We have three such distributions in statistics, which are of prime importance in statistical analysis. They are: the Binomial distribution, the Normal distribution⁹, and the Poisson distribution. They are also termed as classical distributions. Each one of them is subject to many assumptions. For example, the Binomial distribution is subject to assumptions like, an ideal coin (uniform, homogeneous circular disc) or an ideal die (perfect, uniform, and homogeneous cube), large number of throws, independent events, and so on. Likewise, the Normal distribution is subject to defining the mean, the standard deviation, and other parameters of the population. It is also symmetrical. The Poisson distribution is subject to the crucial assumption that one of the chances, say q , becomes indefinitely small and the total number of events (n) is increased sufficiently to keep nq finite, but not necessarily large.¹⁰ All these assumptions of the three theoretical distributions are just hypotheses, which do not have proper exactitude. The distributions, therefore, are just approximations, and do not always match with reality. The Tests of Significance (like, the t-test, the z-test, and the Chi-Square test) used variously to test the validity of the sample results for the given population, are, in fact, based on the given theoretical distributions, and are, as such, subject to the same and even other assumptions, which are also oblivious of reality.

We may, therefore, conclude that the final outcome of all quantitative economic analysis invariably fails to reflect what happens in real life.

The Way Out

Believing in the theory of the second best, the built-in difficulties of quantitative economics, as pointed out above, make us rely more on qualitative economics for better and effective diagnosis of the economic and social problems. Qualitative studies in economics are rather indicative. They optimally mix economic theory with the researcher's own experience of the given context,

8 See Yule and Kendall (1953), Chapter 4.

9 As against Normal Distributions there are also Non-Normal Distributions like, Rectangular Distribution, Triangular Distribution, Cauchy Distribution, and Positive Skew Distribution. For details see Brookes and Dick (1974), Pages 135-36.

10 For details see Yule and Kendall (1953), Chapter Eight.

perhaps through his insights and vision, and also on some kind of a feedback he gets from the concerned respondents.

But even qualitative studies have their own limitations, which can perhaps be easily avoided by taking little extra care. One of the crucial limitations is perhaps the *intended* indifference (and sometimes the ignorance) of researchers towards certain basic/built-in assumptions of the given context. In most of the cases, exclusion of these assumptions from the basic text, eventually lead to acute contradictions and inconsistencies between the stated goals and the actual policy. No matter what the context is, such built-in assumptions are always there.

For example, in the context of informal sector studies the basic built-in assumptions (Anand, 2005¹¹), which are, by and large, ignored are:

- The majority of the entrepreneurs (especially in the micro and small units of the informal sector) are poor, and, hence, apart from other concerns of this sector, one has to focus on the equity and empowerment of the poor entrepreneurs to enable them to have the benefits of growth and development so that they can voice their concerns and have a say in the formulation of policy programmes that directly affect them;
- Informal sector connects economics to society. This reality has four basic dimensions. These are *economic, social, fiscal and regulatory, and conditions of insufficiency*. The *economic dimension* takes us beyond the normal indicators of economic measurement, human resource development, and labour market operations, which invariably neglect or incorrectly measure the activities in informal sector. The *social dimension* relates to gender issue, child labour issues, and dual burden of women as workers and housekeepers. The *fiscal and regulatory dimension* relates to minimum wages, hazardous and unsafe working conditions, environmental pollution, and child labour. The *conditions of insufficiency* are linked with the fact that conditions of work in informal sector are adverse both economically and environmentally;
- Sufficient empowerment of the poor through asset building, and their involvement in the informal pursuits accelerates the pace of development;
- A paradigm shift from technology expansion to market expansion mindset, from production to productivity, and from all kinds of trade to selected unexploited sectors (like, export markets, mass markets) helps informal sector development.

We may, therefore, conclude to say that any policy package for informal sector is best created through qualitative studies provided it takes into account the built-in assumptions as mentioned above. This is equally true of other contexts also. Once this caution is exercised, the ex-post gets equated to the ex-ante.

¹¹ See Chapter 7, Pages 124-133.

REFERENCES

- Anand, Vinod K., (1996). On New Political Economy: An Overview, *The Indian Journal of Economics*, Vol. LXXVII, Part II, No. 305, October, University of Allahabad, India.
- Anand, Vinod K., (2002). Poverty Syndrome: An Added Dimension of Concealed Poverty, *Mainstream*, Volume XXXX, Number 11, March 2, 2002, New Delhi, India.
- Anand, Vinod K., (2001). Corruption in India: Analysis and Remedies, *The Studies in Humanities and Social Sciences (Journal of the Inter-University Centre for Humanities and Social Sciences)*, Volume VIII, Number 1, 2001, Indian Institute of Advanced Study, Shimla, India.
- Anand, Vinod K., (1981). Producers and Users of Data - Some Observations, A Paper Presented at A Conference on Manpower Data: Producers and Users, organised by the Institute of Applied Manpower Research (IAMR), New Delhi at New Delhi on 26-28 April. Mimeographed.
- Anand, Vinod (2005). *Micro Business Economics*, Segment Books, New Delhi.
- Brookes, B.C., Dick, W.F.L., (1974). *An Introduction to Statistical Method*, Heinemann, London.
- Chand, Mahesh, Anand, Vinod (1981). *Economic Theory: A Mathematical Approach*, Kitab Mahal, Allahabad.
- Dowling, Edward T., (1980). *Schaum's Outline of Theory and Problems of Mathematics for Economists*, McGraw- Hill, Inc.
- Koutsoyiannis, A (1988). *Theory of Econometrics*, English Language Book Society (ELBS), Macmillan
- Mansfield, Edwin (1991). *Statistics for Business and Economics: Methods and Applications*, W.W. Norton and Company, Inc. New York/London.
- Moroney, M.J., (1977). *Facts From Figures*, Penguin Books.
- Reid, Gavin C., (1993). *Small Business Enterprise*, Routledge, London and New York.
- Yule, G. Udny, Kendall, M.G., (1953). *An Introduction to the Theory of Statistics*, Charles Griffin & Company Limited, London.

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